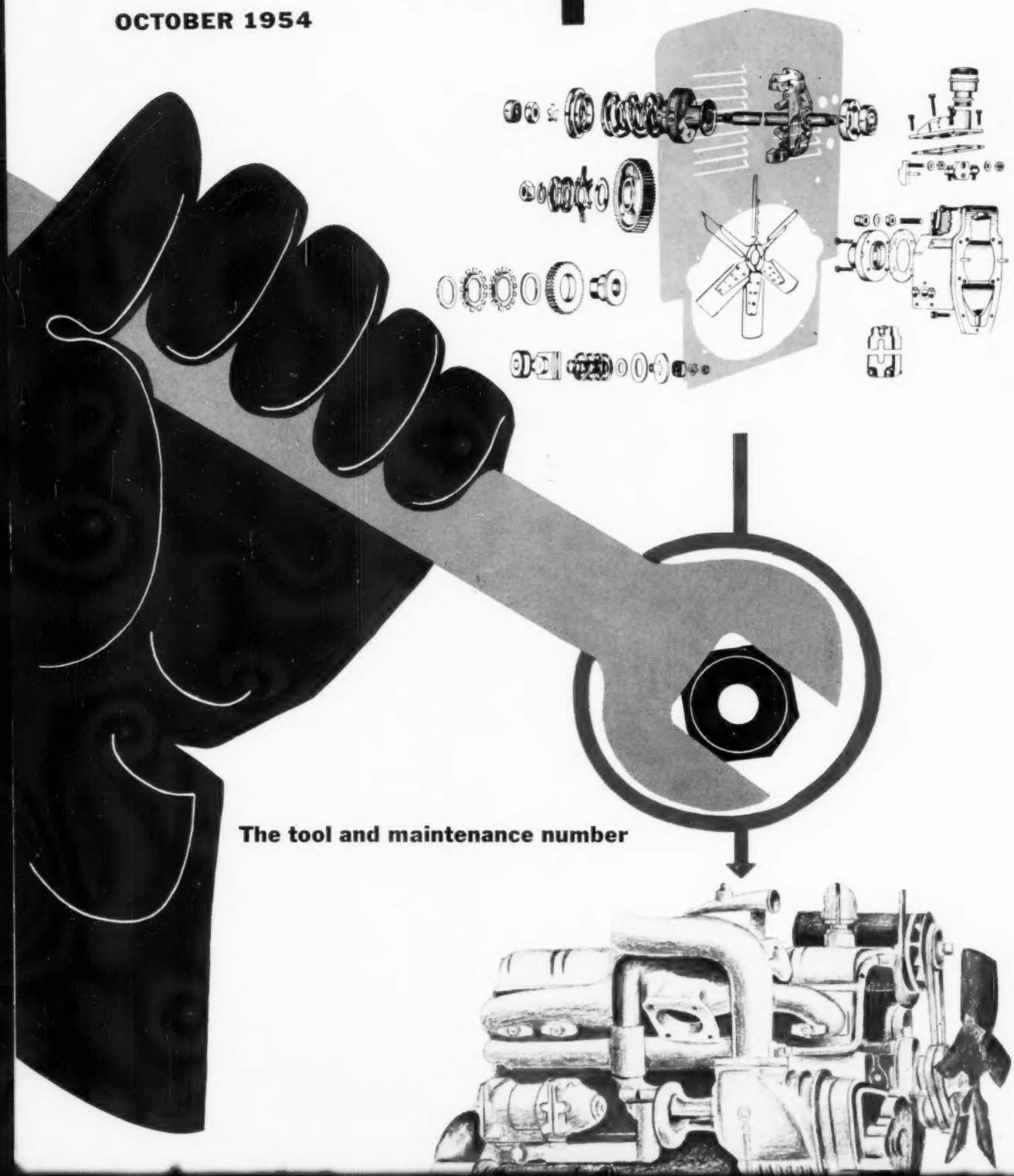
diesel power

OCTOBER 1954



The tool and maintenance number

GOOD EXAMPLE OF LOW COST DIESEL OPERATION . . .

THE REPORT from a South Dakota plant (name on request) states that, for 14 years, this Texaco-lubricated 1,500 h.p. Nordberg diesel was in service for 96 per cent of the time—a total of 117,935 operating hours—with never a stuck ring, and lube oil and fuel consumption consistently low. Average lube consumption, for example, one gallon per 4,855 h.p. hours. Fuel consumption: one gallon per 12.16 kwh generated.

This is outstanding performance—the kind that diesel operators have come to expect from engines lubricated with Texaco.

For diesel, gas and dual-fuel engines there is a complete *Texaco Ursa Oil* series— all especially refined to make engines deliver *more power* with *less fuel* over *longer periods* between overhauls. They are approved by leading engine builders and are preferred by operators everywhere. In fact—

For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help you bring down the cost of your diesel operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO STAR THEATER
starring JIMMY DURANTE
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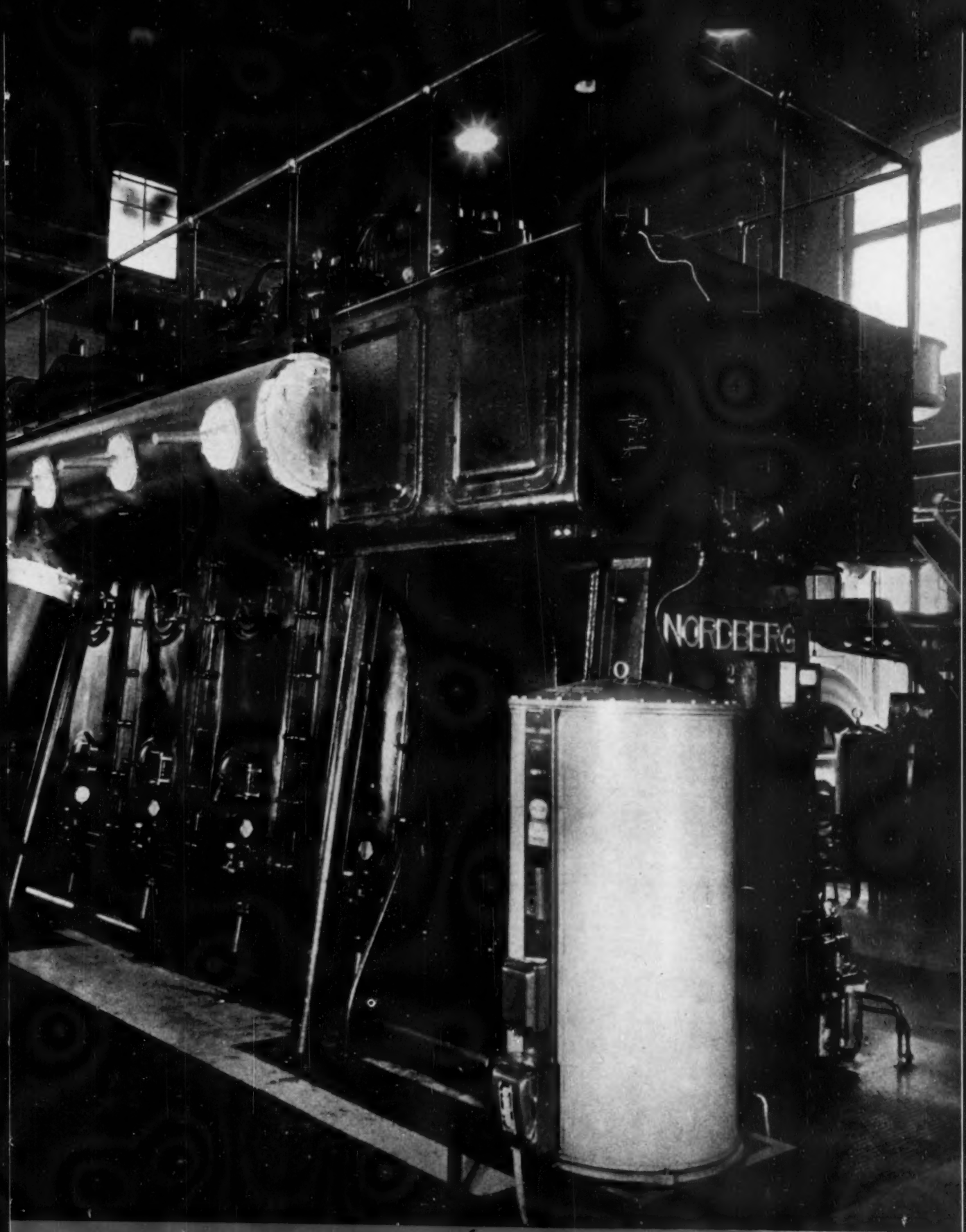
on television
. . . Saturday nights, NBC

TEXACO

TEXACO



URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

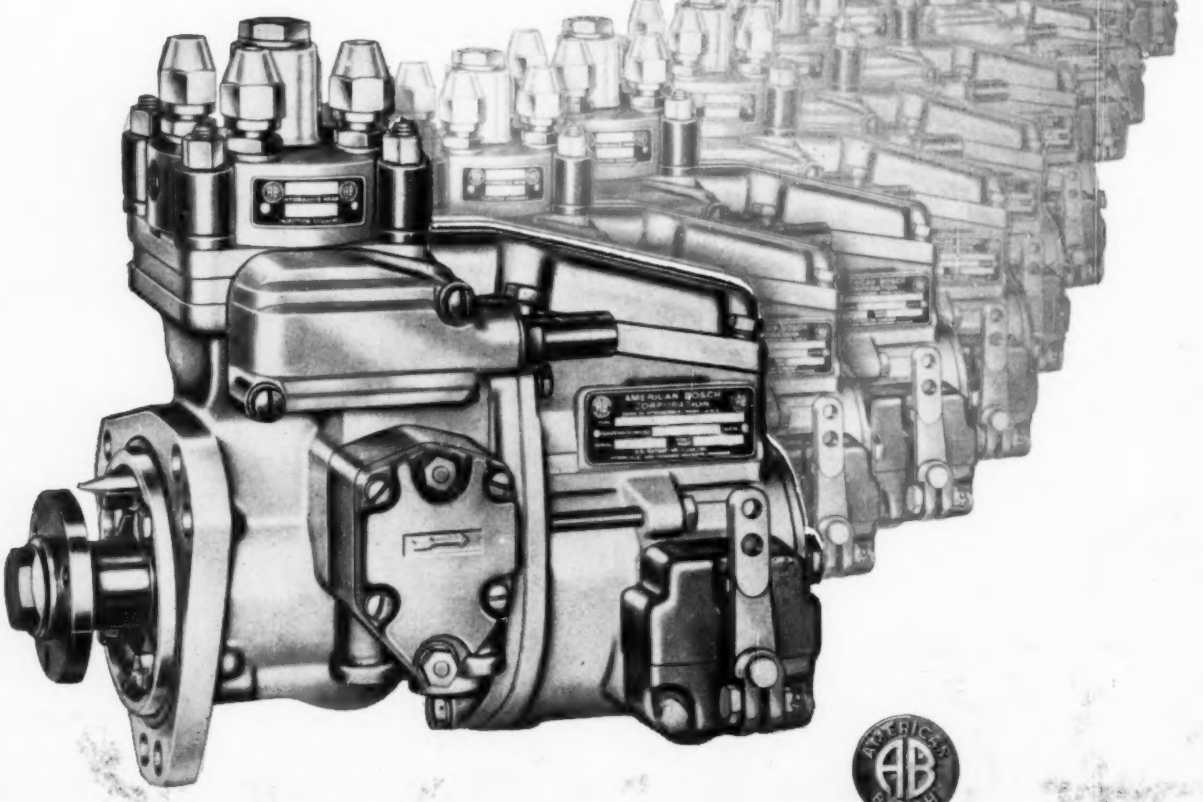
over 60,000 . . . and STILL GROWING

Over 60,000 American Bosch PSB single-plunger distributor-type Diesel fuel injection pumps have been produced since the pump was introduced several years ago.

Today, this simplified, lower-cost pump is being produced at a greater rate than ever before.

Here's definite proof of the acceptance of the PSB. It has literally revolutionized the concepts of fuel injection and made possible smaller, lower-cost Diesel engines . . . opening up new markets for Diesel power such as the farm tractor.

Tried and proved in the severest service, the PSB has rolled up remarkable records of performance—requires less maintenance—is easily serviced in the field. No wonder it has been hailed throughout the industry for its great contribution to Diesel progress.
American Bosch Corporation, Springfield 7, Mass.



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2721 N. Marengo Ave.
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Newspaper Representation Ltd.
British Representative
231 Strand,
London, W. C. 2, England

Georg J. Linder
German Representative
Wittelsbacher Allee 60
Frankfort/Main, Germany

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	9.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER for October, 1954. Vol. XXXII, No. 10. It is published monthly by Diesel Publication, Inc., Kutztown, Pa. Executive and Editorial Offices at 192 Lexington Ave., New York 16, N. Y. Tel. MUrray Hill 3-9874. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1954, Diesel Publications, Inc.

diesel power

Established in 1923 Vol. 32, No. 10 October, 1954

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Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Cable Address: Dieselpub — New York

This Month's Cover

Tooling and maintenance—the catalyst that keeps an assembly of component parts functioning smoothly as an efficient and dependable prime mover.

Random Thoughts from a Filter Engineer

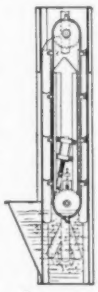
by Dick Brown

- **ENGINEERS DO HAVE IMAGINATION!**
- **WHAT'S THE BIG NOISE IN SILENCERS?**
- **HOW TO MAKE MONEY BY BREAKING EVEN**

ENGINEERS DO HAVE IMAGINATION!

It's fashionable these days to accuse us engineers of not being able to see beyond our slip sticks. We're supposed to be great when it comes to exact calculations but not much when imagination is needed. Don't believe it. Engineers, like writers, are often inspired to real creation. Call it a creative hunch, if you like, but it definitely exists.

For instance, we're proud of a bit of inspiration one member of our engineering department came up with. The idea of a self-cleaning, curtain type filter is not new. But the idea behind Air-Maze's new cleaning action —called "pulse-type" action—*is* new.



Automaze

All self-cleaning filters submerge each panel of the revolving curtain in a cleaning tank at the bottom. But Automaze, (below right), Air-Maze's new self-cleaning filter, goes a step further. It vigorously agitates each panel 6 or more times in the oil bath, gets it *really* clean.

The problem was to find a way of forcefully moving each panel back and forth in the oil bath so that it would be thoroughly cleaned. The solution: a compressed air drive that gives exactly the quick, forceful motion required. It's an Air-Maze exclusive. And a good example, we think, of the kind of imagination that filter users have come to expect from Air-Maze.

WHAT'S THE BIG NOISE IN SILENCERS?

Silence, like Einstein's theory, is a *relative* matter (if you'll pardon a pun). A noise in church doesn't have to be too loud to sound like the arrival of the devil himself. But the same noise in a busy office probably wouldn't cause a secretary to look up from her crossword puzzle. What's objectionable depends on the base level of noise.

Air-Maze In-Line Silencer

Same idea applies when we design silencers for diesel engines. If someone asked us to, we could probably build a silencer that would dampen almost *all* intake noise. But nobody's ever asked us. First, because it would cost far too much and be too big to be practical. Second, because the only *objectionable* part of the intake noise is the part that stands out from the "crowd" of other engine noises that can't be silenced. No one wants to pay for silence he can't "hear".

That's why, in designing Air-Maze silencers, we compromise silence with savings. Most noise is composed of a group of vibrations and we engineer our silencers to dampen the most common combinations of objectionable noise. Our customers like the idea because they get rid of the noise that annoys and don't have to pay extra for silence they can't enjoy.

HOW TO MAKE MONEY BY BREAKING EVEN

Once in a while someone asks us why we knock ourselves out over a small order of little breather filters that sell for less than a dollar apiece. The easiest answer, we suppose, is to point out that we're possibly the largest specialized breather manufacturer in the country. But that would be evading the question because it wasn't always that way and, true enough, we don't think anyone ever got rich on breathers.

But, as we've discovered, breaking even *can* be a money-making way to do business. And breather filters are a case in point. They may be small fry in the filter universe—but not to the man in a customer's plant who's responsible for their performance. And not to us because it's been our program for 29 years to provide the designer with nearly everything he needs to filter air or liquids, treating the little breathers as "equals" to their big brothers in the Air-Maze line. And it's probably not just coincidence that, today, some of our biggest customers for a variety of Air-Maze products first got to know us after we "knocked ourselves out" to land their small orders for breather filters years ago. The Air-Maze Corp., 25000 Miles Avenue, Cleveland 28, Ohio.

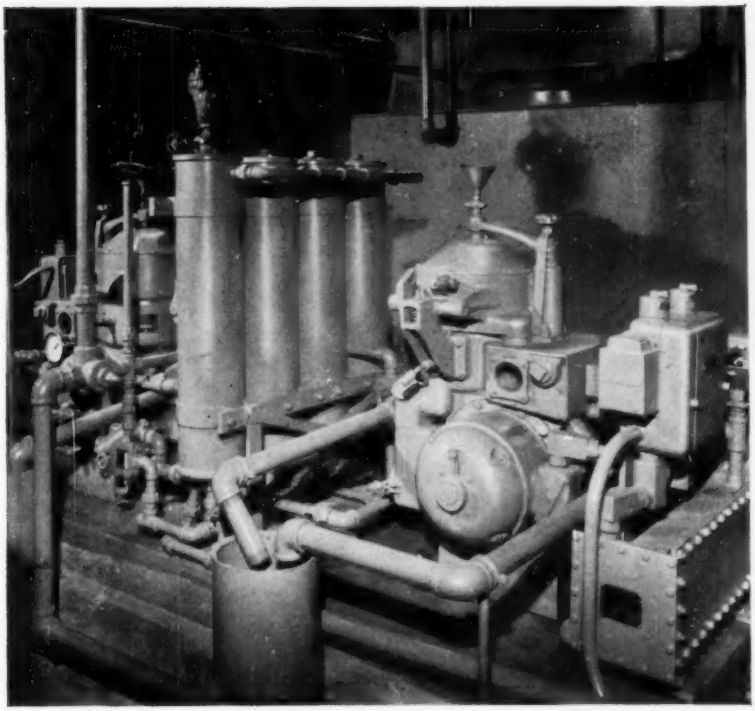
Air-Maze Breather

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

YOU KNOW you're safe when a De Laval "Puri-filter" guards your Diesel Lube Oil...



YOU KNOW that every bit of solid contaminant is being removed—even down to particles as fine as *one micron* (0.000039 in.) . . . . .

YOU KNOW that every drop of water is being taken out of the oil . . . . . .

YOU KNOW that ring sticking is being practically eliminated, time between crank case cleanings stretched out, oil life prolonged . . . . . .

YOU KNOW that you've provided the utmost in dependability—a De Laval "Puri-Filter" will never let you down.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York • 427 Randolph St., Chicago 6
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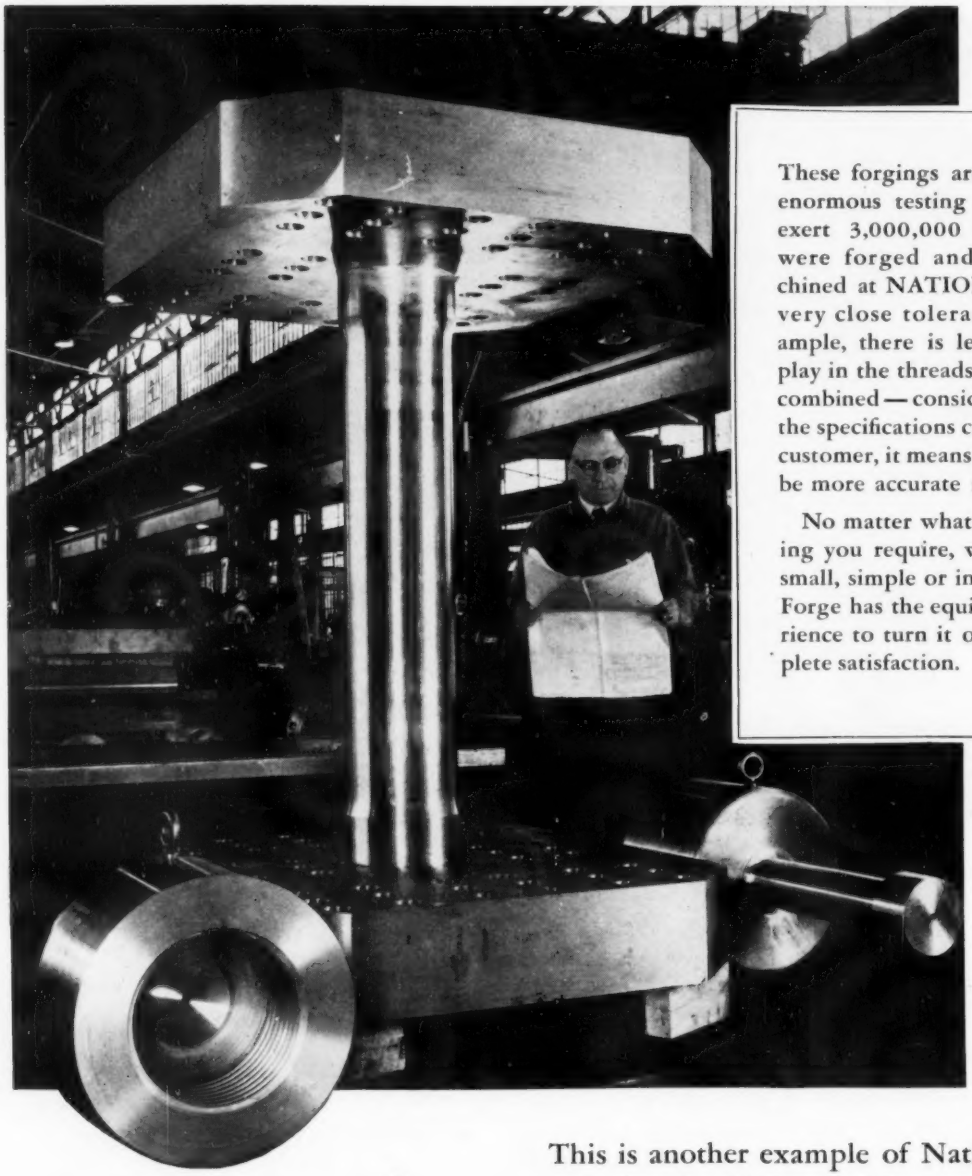
DE LAVAL®

LUBRICATING OIL PURIFIERS

Real "PULL"

...3,000,000 Lbs. Worth



These forgings are fixtures for an enormous testing device that can exert 3,000,000 lbs. pull. They were forged and precision machined at NATIONAL FORGE to very close tolerances. As an example, there is less than .003 in. play in the threads top and bottom combined — considerably less than the specifications called for. To the customer, it means testing data will be more accurate and informative.

No matter what type of machining you require, whether large or small, simple or intricate, National Forge has the equipment and experience to turn it out to your complete satisfaction.

This is another example of National Forge's capacity for high precision machine work.

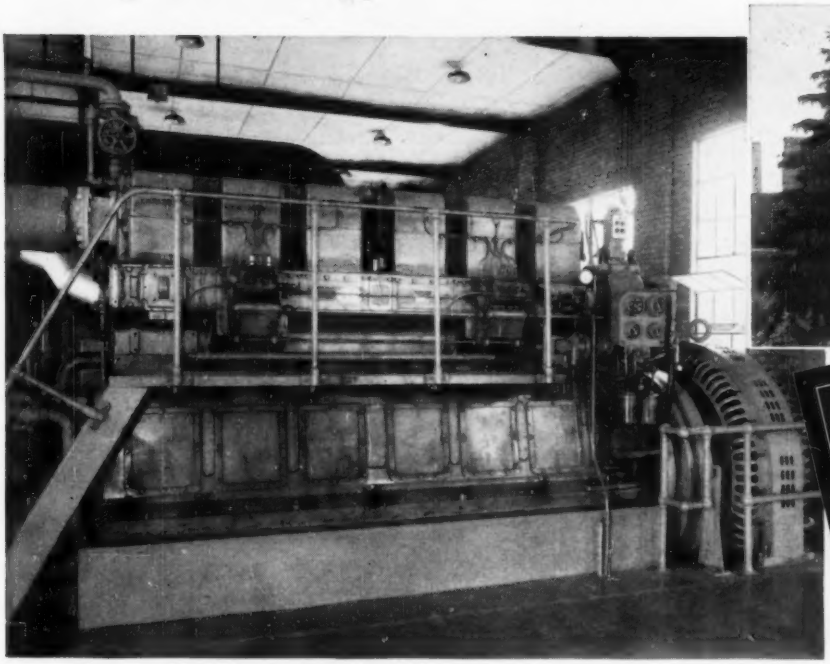
NATIONAL FORGE AND ORDNANCE COMPANY

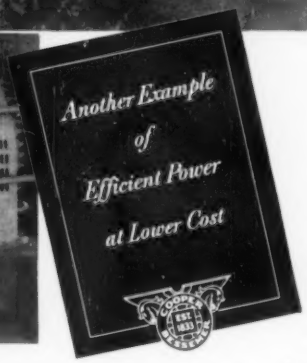
PRODUCES BETTER STEEL FORGINGS AND MACHINE WORK

IRVINE, WARREN COUNTY, PENNSYLVANIA

Here's how

Gowrie Protected Citizens Against Rising Power Costs!





GOOD NEWS for every town with a power problem

Gowrie, Iowa's $200,000 power plant is still generating power with rates no higher today than charged in 1934!

First, the Gowrie plant has always been a good example of what efficient management can accomplish in keeping operating cost down. But despite efficient plant operation it was necessary in 1949 to find a means of offsetting the still rising costs. More efficient, more economical power was needed. After a careful check of various engines, a 515 hp Cooper-Bessemer JS-6 gas-diesel was installed.

This new Cooper-Bessemer, shown here, has been generating power for 4.82 mills per KWH. With Gowrie's original oil-burning diesel, the cost today would average 10.46 mills per KWH . . . 117% more cost than it takes to do the job with the modern unit. And Gowrie's new JS is liquidating itself at a rate of 20% per year.

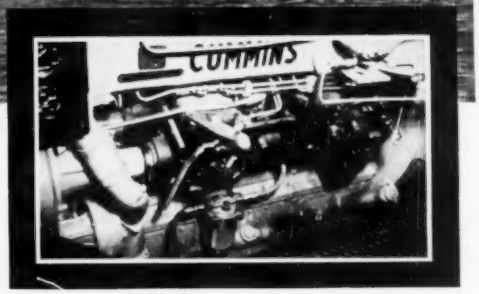
It's not an unusual case. Cooper-Bessemer gas-diesels are doing a dependable, money-saving job in hundreds of installations in all types of service. Get all the facts. They're yours for the asking.

The Cooper-Bessemer Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.

PHOENIX, San Francisco's new 126-ton diesel fire boat, is powered by three 550 h.p., 12-cylinder Cummins propulsion-pumping engines, supplied by Watson & Meehan.



Fire fighter *fights engine wear, too*

FIRES AND DIRTY OIL have this in common—Both are destructive and unnecessary. Care will prevent fires, and Purolator* Fuel and Lube filters will stop excessive engine wear caused by contaminated oil.

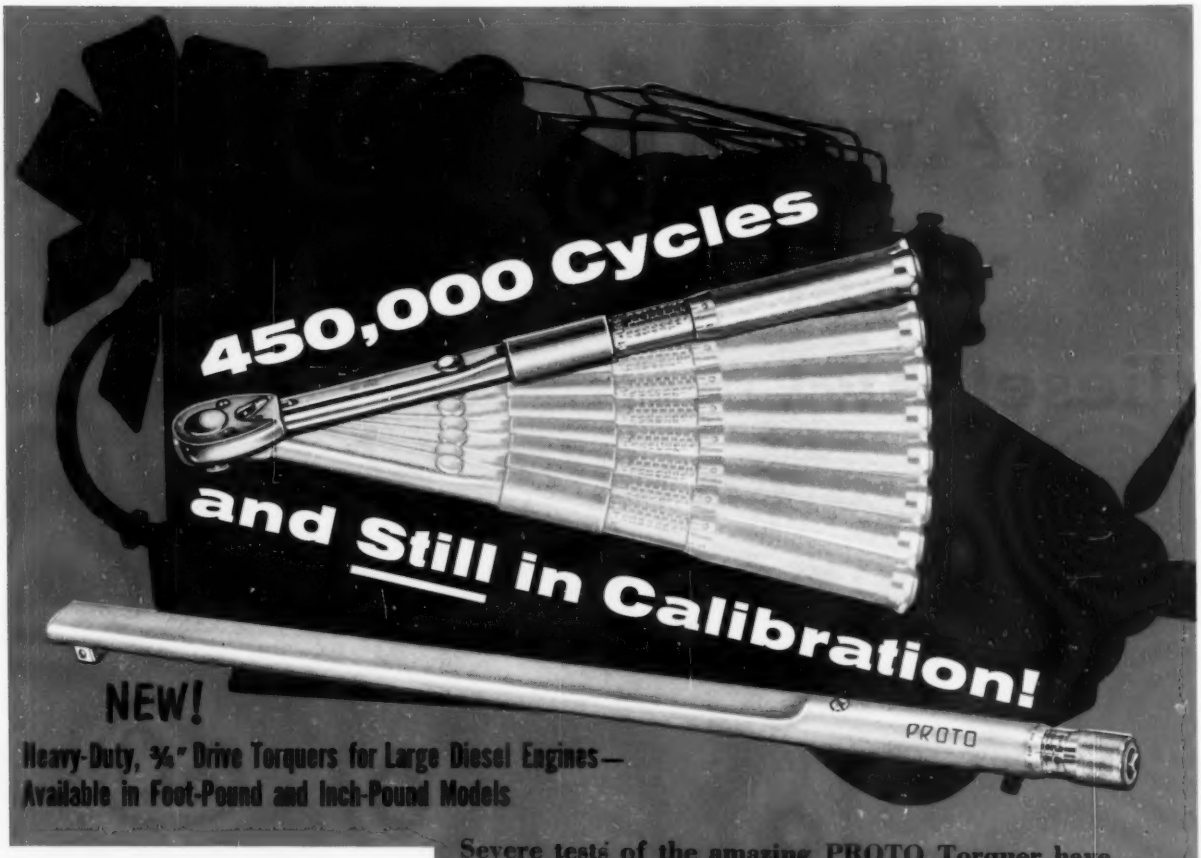
That's why the three 550 h.p. main propulsion and pumping Cummins diesels aboard the *Phoenix* are Purolator-protected. Purolator Micronic* Filters are the No. 1 choice of leading engine builders because they provide up to *ten times* the area of depth-type filters; stop particles *sub-microns* small; won't channel or unload; won't strip additives . . . yet permit high flow rates in minimum housing space.

Whatever your filtering problem, our Engineering Department can help you solve it! *Write for the new Purolator Industrial Catalog*—it details the many units in the line—contains information about filtration equipment sure to meet your most exacting standards.

*Reg. U. S. Pat. Off.

PUROLATOR
WORLD'S FINEST OIL FILTER

PUROLATOR PRODUCTS, INC., Rahway, New Jersey, and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles



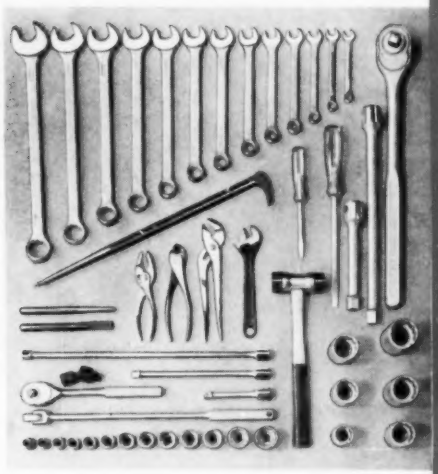
NEW!

Heavy-Duty, ¾" Drive Torquers for Large Diesel Engines—Available in Foot-Pound and Inch-Pound Models

Severe tests of the amazing PROTO Torquer have resulted in its approval and widespread use by many manufacturers and users of diesel engines. A large producer of diesel engines subjected a Torquer to 450,000 torquing cycles and found the tool still in calibration within specified tolerances! A diesel locomotive company, after exhaustive tests, added PROTO Torquers to its railroad catalog. Reasons for the Torquer's acceptance by railroads, other diesel users and manufacturers are many. They like its *automatic* release, great speed (fastest in the World), accurate micrometer-type adjustment, rugged trouble-free design, and absence of pointers, dials and other "gadgets." Besides ¾" drive, heavy-duty "giants," the line includes models in ½", ⅜" and ¼" drives—providing a wide range for diesel work. Ask your PROTO dealer for an on-the-job demonstration of the fabulous Torquer. Send 10c for 68-page catalog showing the entire PROTO line to

PLOMB TOOL COMPANY
2274Z Santa Fe Ave., Los Angeles 54, Calif.

ALSO NEW!
No. 9940 Set for Diesel Maintenance



In one carefully selected professional quality set you get 51 of the most necessary tools for diesel engine maintenance. The set includes end wrenches, an adjustable wrench, socket wrenches and attachments in two drive sizes, pliers, screwdrivers, a bar, a soft-faced hammer, a punch and a chisel.

PROTO® TOOLS
PROTO means PROfessional TOols

Eastern Factory—Jamestown, N.Y.
Canadian Factory—London, Ont.

5495

Announcing...

revolutionary new diesel fuel system... as simple as gasoline carburetion and ignition

Exclusive PT Fuel System now standard on all Cummins Diesels

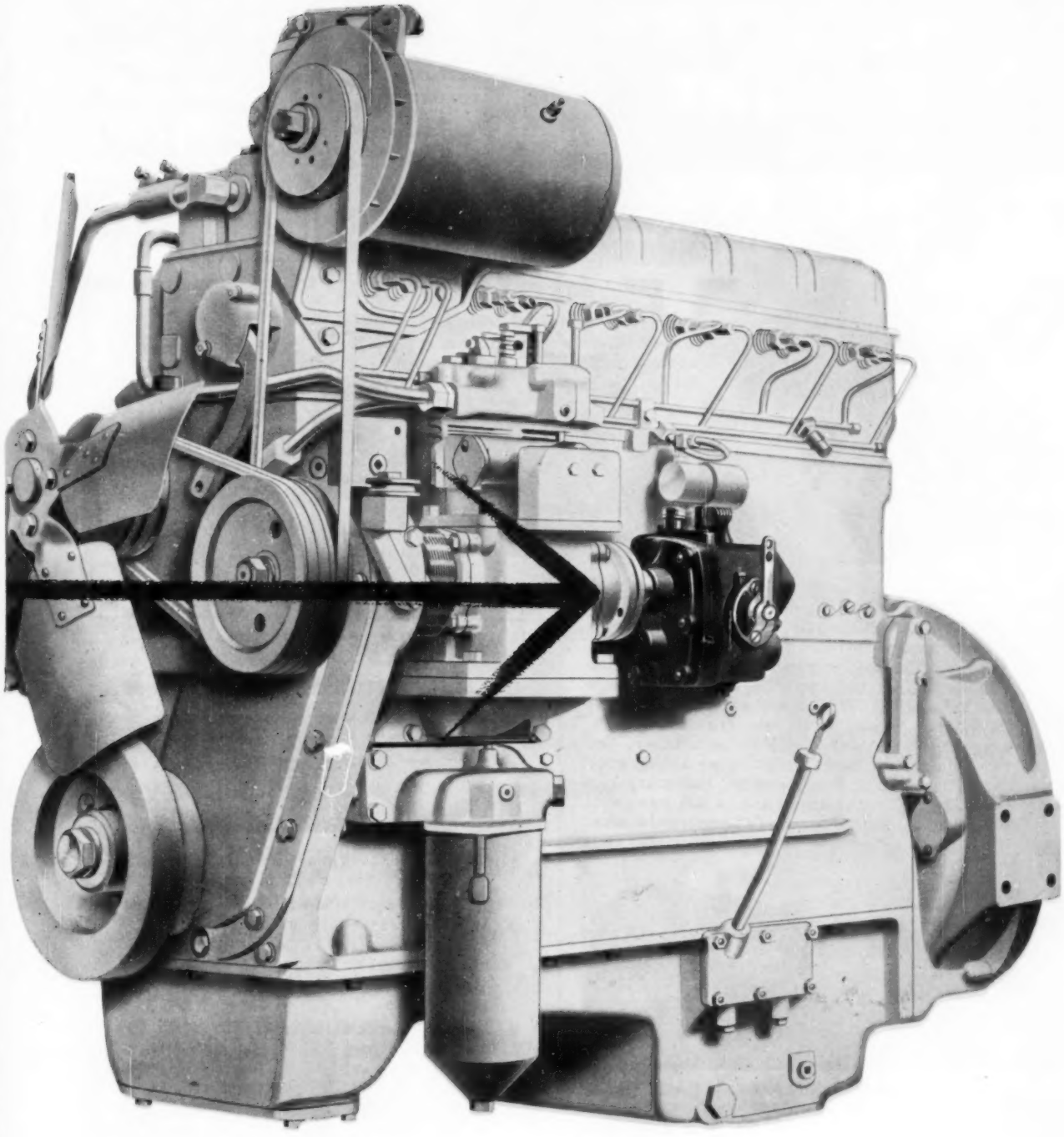
- Drastically reduces maintenance costs
- All mechanics can understand and service it
- Pump weighs only 13 pounds—system has no racks, check valves, metering plungers, discs, floats, etc.— does not have to be timed to engine
- Adaptable to all Cummins Diesels built since 1932

Write for your copy of descriptive folder "Cummins PT Fuel System."

CUMMINS **Cummins**

Engine Company, Inc., Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)



THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

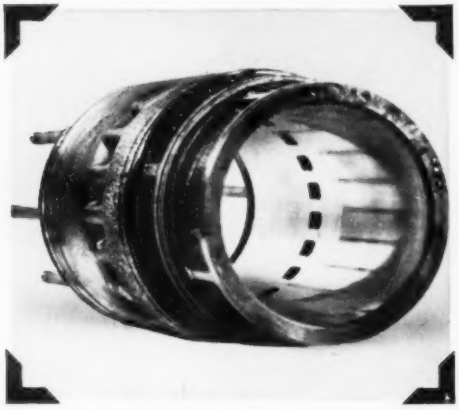
UNIT Diesel locomotive

SERVICE Mountain freight haul

CONDITIONS Long, continuous grades to 1.6%

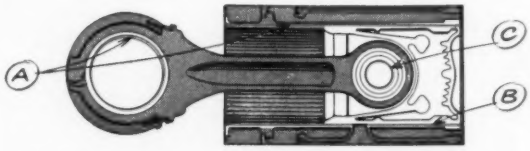
FIRM The Milwaukee Road

333,590 freight miles—only 0.0035 inch liner wear!



LUBRICATED WITH RPM DELO OIL R.R., this representative cylinder assembly was in good condition when pulled for regular inspection after 333,590 actual freight miles. Operation was on The Milwaukee Road's tough run between Othello, Washington, and Avery, Idaho. This liner, shown as it came from the engine, miked only 0.0035 inch wear, 0.001 inch taper, despite hard operating conditions—heavy loads, wide temperature variations, heavy grades, including one stretch of 20 miles of continuous 1.6 percent. Neither wristpin or bushing showed measurable wear.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

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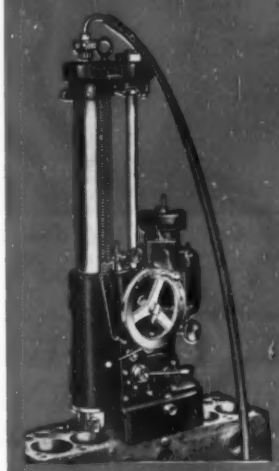
with Kwik-Way CYLINDER BORING MACHINES on the job

KWIK-WAY Cylinder Boring Machines are simple in set up and operation. They're precision engineered for maximum accuracy—real time-savers on all types of boring jobs.

Call in your KWIK-WAY man for a demonstration . . .
See these superior features in action:

- **Overhead chip removal**
- **Screw feed with automatic retraction**
- **Two speeds—instantly changeable**
- **Three finger centering**
- **Quick, positive, non-distorting anchoring**
- **Rigid construction—no additional supporting devices necessary**
- **Bores close to dash**
- **V-belt spindle drive eliminates evidence of gear chatter on finished cylinder wall**
- **Pre-loaded spindle bearings**
- **Quick, easy, accurate tool setting eliminates "sense-of-feel"**

Model "FT"
Capacity
2.630" to 5 9/32",
12½" stroke



Model "FR"
Capacity
2.2" to 4 7/16",
12½" stroke

KWIK-WAY precision equipment is sold only through factory trained representatives. Mail the coupon below for appointment or complete information.

Kwik-Way

SERVING THE MOTOR REBUILDING INDUSTRY SINCE 1920

VALVE FACING MACHINES • VALVE SEAT GRINDERS • VALVE SEAT INSERT TOOLS CYLINDER BORING MACHINES • VORTEX SUCTION DEVICE • LINE BORING MACHINES • PISTON CAM TURNING AND GRINDING MACHINES.

Cedar Rapids Engineering Co.,
918 17th Street N.E., Cedar Rapids, Iowa

☐ Please send complete details on Kwik-Way Cylinder Boring Machines
☐ Kwik-Way Man to Call
☐ _____
Other Equipment in which interested

Name _____
Company _____
Street _____
City _____ State _____

Great new line of

GENERAL MOTORS LOCOMOTIVES

Twenty-five New GP9's Delivered to Great Northern

Now there are 509 General Motors Diesel units in Great Northern's fleet! Their 25 latest GP9's have the new 1750-horsepower ratings. And that extra power teams with the GP9's increased tractive effort—equipping Great Northern to handle bigger-than-ever jobs at lower-than-ever costs.

The ability to pull longer trains or make better schedules! That's what makes General Motors Locomotives top choice of America's railroads.

Great Northern—like many other leading lines—has a wide variety of GM Diesel units including freight and passenger units as well as yard and road switchers. So the operating department never has any difficulty in balancing motive power and train requirements. With this versatile GM Diesel fleet, they can always pick the *right* locomotive for the job.

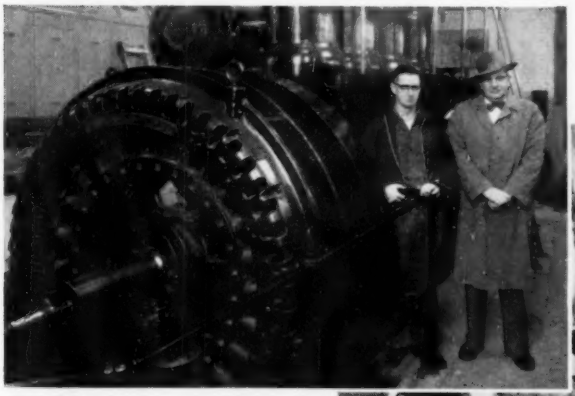
The Best Locomotives are Even Better Today!

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

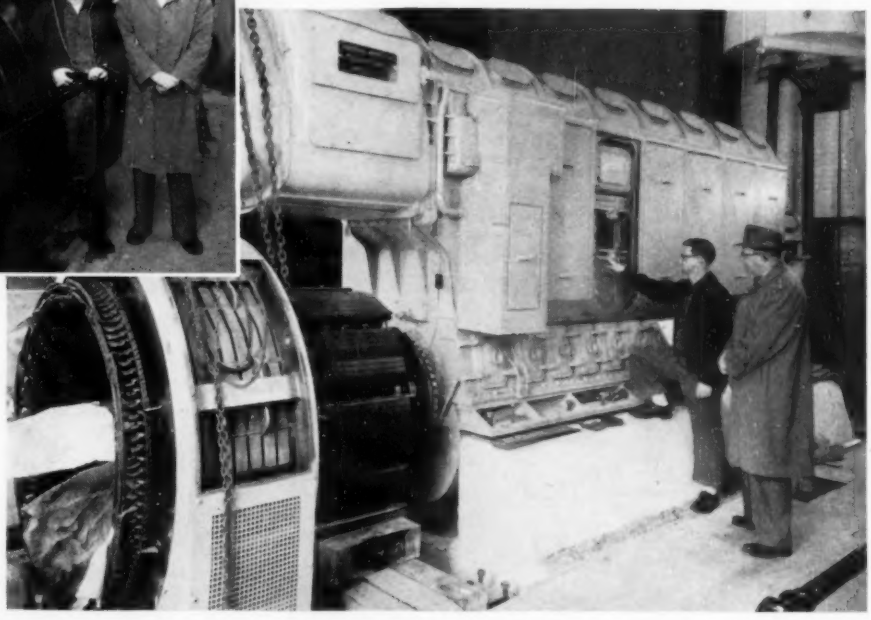
GENERAL MOTORS LOCOMOTIVES

La Grange, Illinois • Home of the Diesel Locomotive • In Canada: GENERAL MOTORS DIESEL, LTD., London, Ontario

10 YEARS OF PURE-SURE OPERATION



(Above) Mr. Chester W. Willin, Chief Engineer of Seaford Power and Light Company, Seaford, Delaware, and Mr. W. B. Graham, Pure Oil Branch Manager, beside 4-cylinder Fairbanks-Morse Diesel engine which has been operating smoothly and economically on Pure diesel lubricants for the past ten years.



(Right) Chief Engineer Willin shows W. B. Graham why they have selected Pure diesel lubricants for this new 12-cylinder Diesel being installed at the Seaford Power and Light Company.

...so Seaford selects Pure Oil Diesel Lubricants for new 12-cylinder engine

This Delaware city has been using Pure Oil diesel lubricants for ten years. They know—along with many others—that Pure diesel lubes are the *sure* way to keep engines running smoother, longer and with greater economy.

Pure Oil makes a complete line of quality diesel lubricating oils including: Purodiesel series, Purodiesel XD series, Sultana X series, Sultana SHD series, and Klondyke series. Each is tailored to meet the needs of a particular set of operating conditions while insuring easy reclamation and long use life.

Your local Pure Oil diesel expert will be glad to help you select the right Pure Oil diesel lubricant for your particular unit and operating conditions.

FREE used oil analysis foretells engine trouble... saves costly repairs

Don't guess about the condition of the lubricating oil in your engine. A pint sample of used oil subjected to Pure's analysis system will permit our technicians to determine this and report to you any need for adjustments. To get this FREE Pure-sure Used Oil Analysis, send coupon today!

Offer must be limited to the area where Pure Oil products are sold.

PURE OIL DIESEL LUBRICANTS

FREE BOOKLET

The Pure Oil Company, Dept. D-410
35 East Wacker Drive
Chicago 1, Illinois

Send me information on how I may obtain a Pure-Sure Analysis of my used diesel lubricating oil without cost or obligation.

Name_____
Position_____
Company_____
Address_____
City_____ Zone_____ State_____

Field Replacement

OF FUEL, AIR, WATER AND OIL LINES

Quick and Easy

WITH

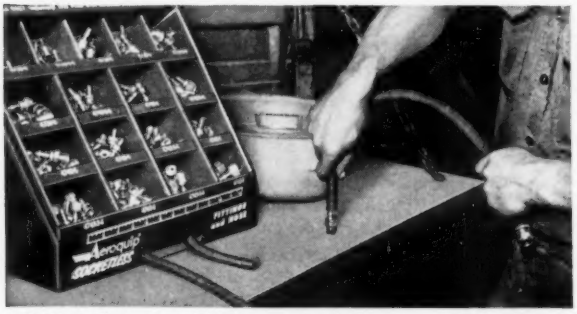
NEW AEROQUIP

SOCKETLESS

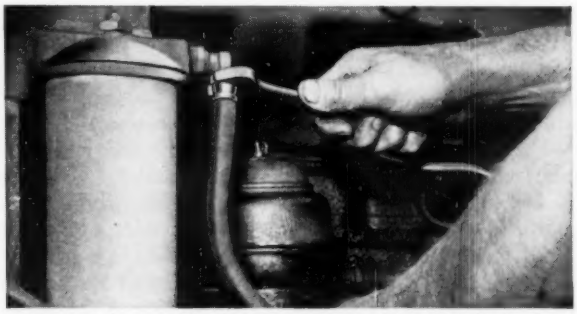
FITTINGS AND HOSE KITS

● Hose lines are the life lines of construction equipment. The breaking of a single fuel, air, water, or oil line while equipment is on the job results in expensive downtime until the damaged hose line can be replaced.

● This compact, new Aeroquip kit can be carried right on your field service truck. It contains a complete assortment of *SOCKETLESS* fittings and reels of Aeroquip 1525 hose that can be cut to required length.



● Hose line assembly is amazingly easy . . . and QUICK! No tools of any kind are needed because 1525 hose can be *pushed* on the *SOCKETLESS* fittings by hand. In spite of the ease of assembly the fittings STAY on.



● By making fuel, air, water, and oil lines right in the field you save time and money. Solve your hose line replacement problems with this Aeroquip *SOCKETLESS* kit. See your distributor or write us for information.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD ● AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

YOUNG DIESEL COOLING RADIATORS...

MEET SEVERE SERVICE REQUIREMENTS

SECTIONAL-TYPE CORE RADIATOR FOR LUBE OIL AND JACKET WATER COOLING

Rugged Young Sectional-type "Mono-Weld" Radiators noted for ease and economy of maintenance, cool the newly-announced Sterling Engine Company Diesel-generating plants built for the United States Navy. These plants were developed in cooperation with the Navy Bureau of Yards and Docks.

These Young "Mono-Welds" provide efficient cooling under severe conditions, withstanding ambient temperatures, in this installation, varying from 0° F., to 125° F., under constant exposure to solar radiation . . . and, they resist rigors of travel over rough terrain at speeds up to 35 mph!

Young one-piece and sectional-type Radiators serve stationary, portable and stand-by power plants, in oil-field pipeline compressor and booster stations . . . in heavy industrial, municipal, and chemical process installations. Capacities for rejecting heat range from 70,000 to 3,250,000 Btu per hour. For further information, see your Young Representative listed in the yellow pages of the telephone book, or write direct.

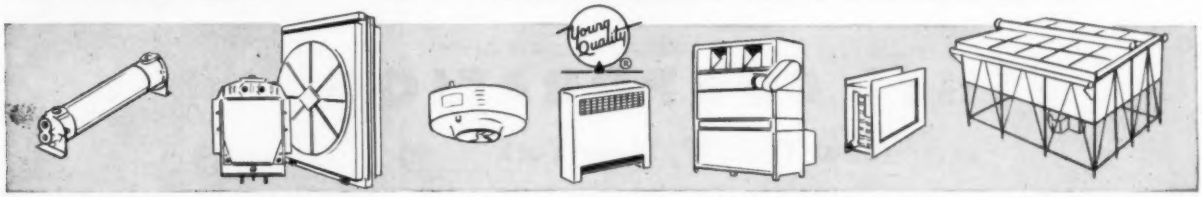
Write for further details or catalogs, without obligation.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 4 4-K, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.



Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

"Ethyl" Diesel Ignition Improver

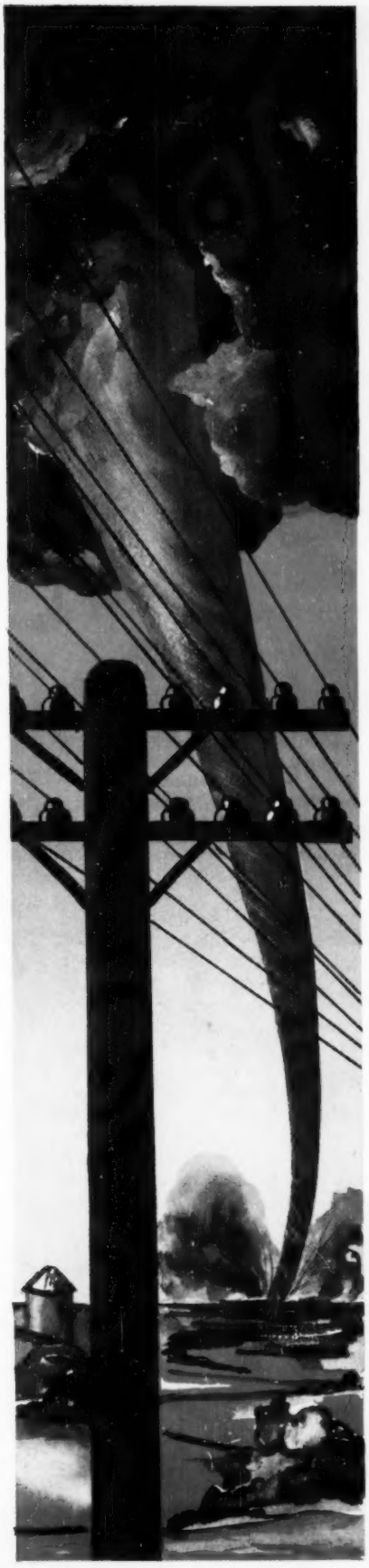
. . . is now being used in fuels for diesel locomotives

Year-long tests on two railroads have just confirmed that the cetane number of diesel fuels can be effectively raised with this Ethyl additive.

Ethyl's new additive offers many advantages to railroad users. It makes available diesel fuels with lower pour point, higher volumetric heating value, and more uniform ignition quality. This tends to minimize cold-weather operational problems, increase operating economy, and reduce maintenance costs.

ETHYL CORPORATION

New York 17, New York



POWER LINES ARE VULNERABLE

Wherever there may be a tornado, earthquake, flood or other disaster the saving of many lives and millions in property damage can be accomplished by fast restoration of power.

Within SECONDS of power failure Synchro-Start Controls activate any stand-by engine to produce emergency power for vital utilities such as, fire protection, communications, light and refrigeration. When main line power is restored the controls quickly transfer the load.

Synchro-Start, being a pioneer in the field of automatic control, has highly engineered and tested each and every product to give the utmost in quality and performance. Send in your specifications or problem and the Synchro-Start engineers can recommend the proper control for your installation.

SYNCHRO-START PRODUCTS, INC.

8151 N. RIDGEWAY AVENUE • SKOKIE, ILLINOIS

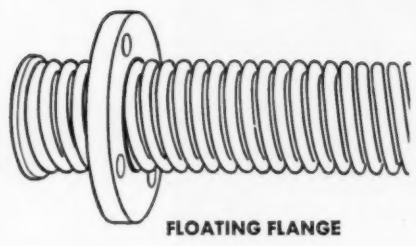
Please Send Information on —

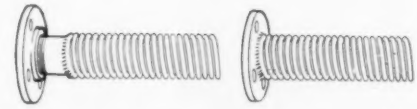
OVERSPEED GOVERNORS ☐ D. C. SOLENOIDS ☐
ALARM SETS ☐ STARTER CONTACTORS ☐
FULL AUTOMATIC CONTROL SETS ☐

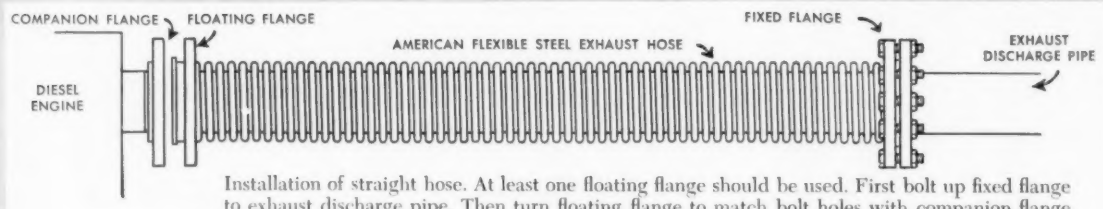
ENGINE MAKE AND MODEL _____
TO _____
COMPANY _____
ADDRESS _____

AMERICAN FLEXIBLE STEEL HOSE

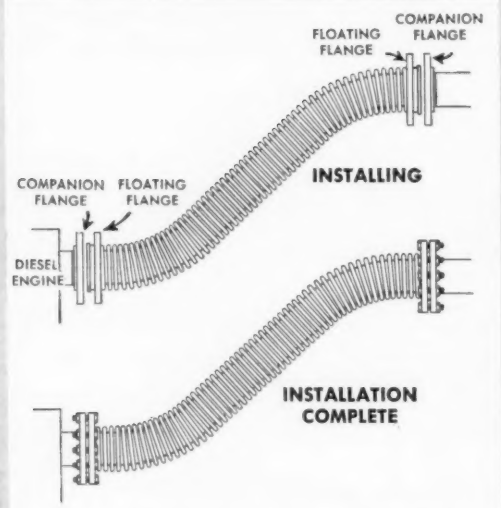
Here's how it is easily installed with floating flanges in diesel exhaust systems







Installation of straight hose. At least one floating flange should be used. First bolt up fixed flange to exhaust discharge pipe. Then turn floating flange to match bolt holes with companion flange on rigid piping and bolt up. Lining up is easy. You don't have to twist the metal hose itself.



Installation of bent hose. Two floating flanges should be used. You can make connections easily even though bolt holes in companion flanges are not lined up. Simply turn floating flange at each end to match bolt holes in companion flange. Then bolt up.

American Flexible Steel Exhaust Hose can be supplied with either fixed, made-on or floating flanges. Because this hose is *flexible* it bends into desired position easily. It absorbs vibration readily and prevents its transmission into surrounding structures. It also allows for expansion and contraction caused by temperature changes in the exhaust lines. It prevents overstressing of bolts and distortion of engine parts.

American Flexible Metal Hose for exhaust and air intake – marine or industrial diesels – is available in corrugated steel, 2 in. to 16 in. I.D. inclusive. For more information, write for Bulletin EH-50-1 to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

OTHER PRODUCTS FOR DIESEL USE – Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze, carbon steel and stainless steel. Assemblies complete with fittings. 54214

WHEREVER CONNECTORS MUST MOVE

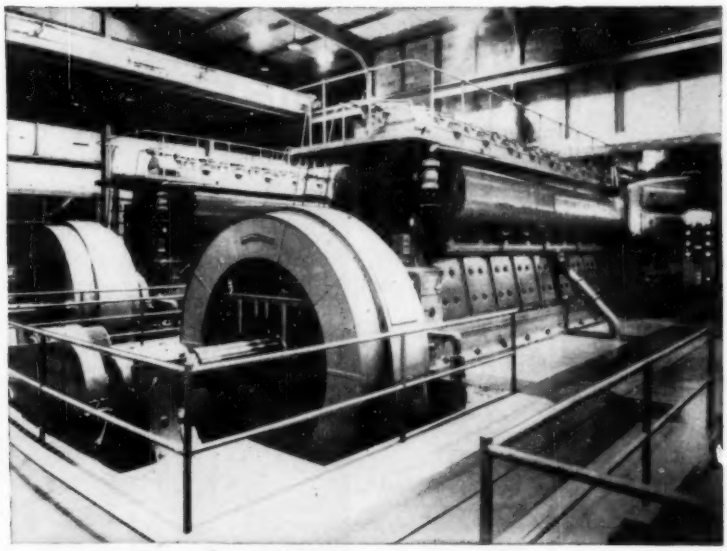
AMERICAN

flexible metal hose and tubing

an ANACONDA® product

HOW DOES YOUR DIESEL OPERATION COMPARE WITH THESE TWO?

2 YEARS OLD! . . . 16,280 HOURS! . . . NO REPAIRS! During two years of grueling work, mining 203,000 tons of coal from a 36″ seam with an average overburden of 35 feet hard pan shale, this Marion 111 M shovel never required repairs . . . never increased its oil consumption!



LARGEST REA PLANT IN KANSAS REPORTS DC-840 OIL EXCELLENT! Using Cities Service DC-840 Oil for power cylinder and crankcase lubrication in its Fairbanks-Morse diesels, Wheatland Electric Cooperative, Inc. has observed the following results: No overhaul or major breakdown . . . rings free in groove with no sign of wear . . . no oil change at end of 9,000 hours . . . 3500 H.P. hours per gallon of lube oil.

MOBILE DIESEL

A report from the Farbizo Coal Co., Dover, Ohio: Using Cities Service DC-330 Oil for two years for its Marion 111 M Shovel, Farbizo observed the following results: No motor breakdown or repairs in 16,280 hours. Oil consumption 1 pint per week . . . same as when shovel was new. Motors recently inspected, but no repairs or replacements needed. Similar results using DC-300 Oil in two Gradall shovels and International TD 24 Bulldozer.

STATIONARY DIESEL

A report from Wheatland Electric Cooperative, Inc. — largest Rural Electrification Association Plant in Kansas. Plant uses Fairbanks-Morse Diesels, serviced by Cities Service DC-840 Oil for power cylinder and crankcase lubrication:

1. House operation each unit—13,000 hours
2. No oil changes due to oil failure
3. No overhaul or major breakdown
4. Rings Free in groove with little or no signs of wear
5. Oil consumption remains within manufacturer's recommendation
6. Fuel consumption at 10,572 BTU/KWH a load factor of 63.7%
7. Maintenance of lube oil at minimum expense
8. 3500 H.P. hours per gallon of lube oil
9. No wear on main rod or bearings
10. No oil change at end of 9,000 hours

These two reports are typical of the results achieved by the use of Cities Service products in hundreds of diesel operations throughout the country. Perhaps Cities Service can do a similar job for you. For details, contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

REDUCE cleaning time on Diesel engine parts

with

VAPOR BLAST*

V-B Liquid Honing*

CLEAN PISTONS 14 TIMES FASTER... IN MAINTENANCE OPERATIONS

That's the experience of Pacific Intermountain Express, one of the nation's leading motor freight carriers, in their Diesel maintenance operations at Denver.

With Vapor Blast Liquid Honing equipment P.I.E. has cut piston cleaning time from 14 hours to 1 hour.

DE-BURR INJECTOR CUPS 8 TIMES FASTER... IN ORIGINAL MANUFACTURE

That's the experience of Cummins Engine Co., Inc., Columbus, Indiana. Write for portfolio of authenticated case histories of cost savings through Liquid Honing in the Diesel industry.

Liquid Honing removes internal burrs on injector cups which are virtually inaccessible to conventional methods.

VAPOR BLAST MFG. CO.
3005H W. Atkinson Ave., Milwaukee 16, Wisconsin

☐ **Under separate cover we are sending you a part for FREE DEMONSTRATION of VB Liquid Honing. We expect a complete report with return of part.**

☐ **Please send complete details on VB Liquid Honing.**

Our product is .....

Firm .....

Address .....

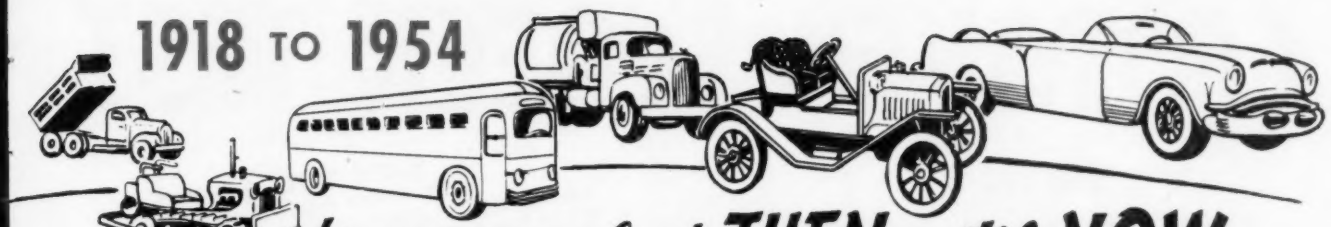
City ..... **State** .....

Attention of .....

V-B

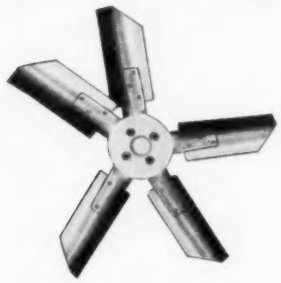
"Vapor Blast" and "Liquid Honing" are trademarks.

Model 3030, Type B-20



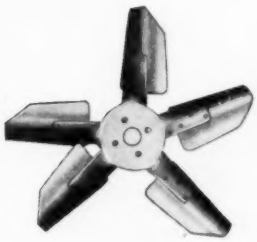
from away back **THEN** *until* **NOW**

SCHWITZER-CUMMINS
Specialists in COOLING FANS



Heavy Duty Truck Fan

Shown Here **are samples of many fine cooling fans with individual characteristics compounded for best performance of the engine and engineered, developed and manufactured in Schwitzer-Cummins plants and laboratories for blue-ribbon engines in the automotive world.**



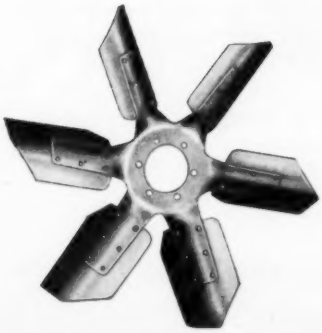
Extra Cooling Passenger Car Fan

The founders of Schwitzer-Cummins Company were consultants on engine cooling in the pioneering days of the automobile. Then, with the formation of the company 35 years ago, became active as manufacturers of cooling fans and water pumps and qualified immediately as major suppliers to the then young automotive industry.

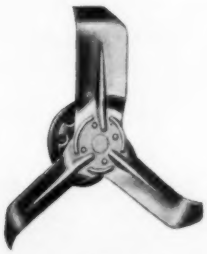
During this long stretch, a world of experience in fan design, application and manufacture has become centered in our fan division. Thousands of tough problems have been solved for our customers and much creative engineering has given the industry many "firsts" while manufacturing facilities have kept ahead of the times and remained unsurpassed for low production costs and precision work.

We are complete to develop and produce fans in an extensive variety of shapes, sizes, materials for virtually all purposes, automotive and stationary.

May we work with you on your next cooling fan requirement?



Heavy Duty Bus Fan



Passenger Car Fan

Light Truck Fan

Other Products

- EXHAUST DRIVEN TURBOCHARGERS
- SUPERCHARGERS (POSITIVE DISPLACEMENT)
- OIL PUMPS
- THERMOSTATICALLY CONTROLLED FAN DRIVES
- WATER PUMPS
- AIR STARTING MOTORS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING
- CRANKSHAFT VIBRATION DAMPERS

SCHWITZER-CUMMINS COMPANY

1125 MASSACHUSETTS AVENUE • INDIANAPOLIS 7, INDIANA

Specialists in Automotive Cooling for Over a Third of a Century

CP* TAKES SCREEN TEST

Winslow Discovery Stops Sludge Show!

Oily Critics Amazed by Performance!

GETS TOP BILLING IN FILTER FROLICS

by hedda lettuce

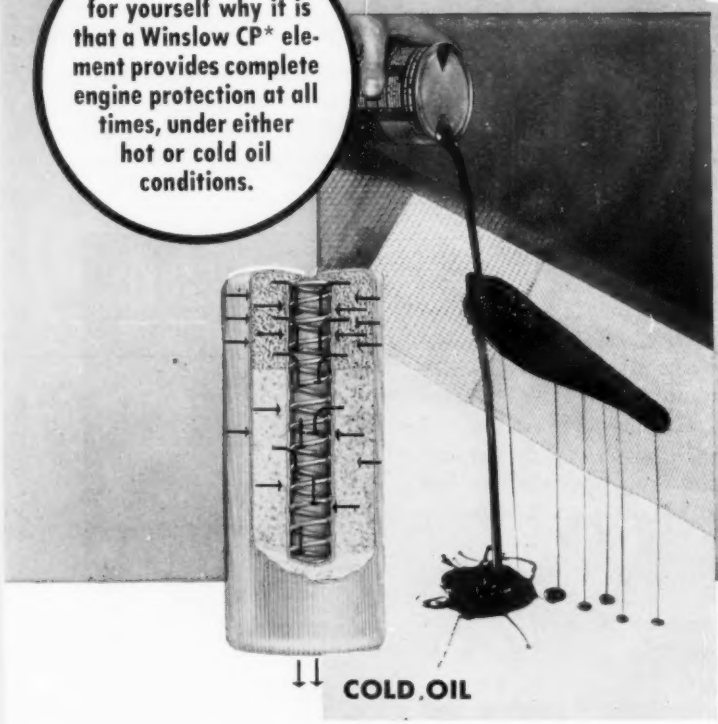
EMERYVILLE: Folks around here are talking about the sensational performance of "Cee Pee", the latest Winslow discovery who went before the cameras yesterday and came out smelling like a filter with a job well done.

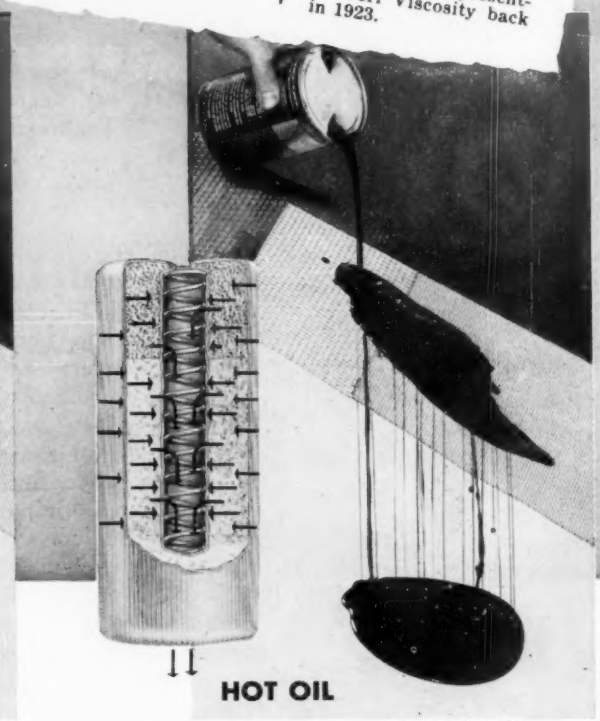
Prior to yesterday's test there were those who doubted that "Cee Pee" had the stuff it took to be a star. But there's no doubt now.

"Cee Pee" handled her oil lines perfectly. Pressure didn't bother her. Not once did she find it necessary to open her bypass. It was a real Three-D performance—filtering, cleaning, and protecting.

It looks like a long term contract for "Cee Pee" with the industry. No one here has seen anything like her since Cecil B. DeMillwheel presented Veri Viscosity back in 1923.

You can see for yourself why it is that a Winslow CP* element provides complete engine protection at all times, under either hot or cold oil conditions.





PHOTOGRAPHS ©

Cold oil is poured over both portions of the screen. As can be seen the entire surface passes oil, with the majority going through the less dense section. There is no excess left.

In a Winslow CP* element there are also two sections, one more dense than the other. The less dense section is a very small portion of the entire assembly(1). Under COLD OIL conditions the Winslow CP* element reacts exactly as is shown in the screen test.

Under pressure the cold oil is all filtered. Dangerous particles are filtered out so that the engine is protected even under COLD OIL conditions. There is no unfiltered oil left to activate the by-pass. In a Winslow CP* element the by-pass acts *only* as a safety valve.

Under HOT OIL conditions the Winslow CP* element reacts exactly as is shown in the screen test. The less dense portion is still filtering some oil but the dense portion is taking more and more—automatically controlling pressure losses, as oil viscosity dictates.

Under HOT or COLD oil conditions *complete filtering of all the oil* is assured for within a single full-flow element the Winslow CP* performs as both a full-flow and a shunt filter.

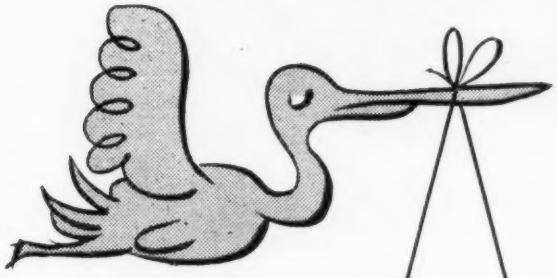
(1)Strict field and lab tests have proved that even the less dense section of a CP* element will remove all particles of a harmful nature.

WINSLOW FILTERS

*FULLY PROTECTED BY PATENTS AND TRADEMARKS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

A NEW ARRIVAL



To the Petter air-cooled diesel engine family

1½ & 2½ H.P.

Range NOW 1½ - 40 H.P.

BACKED BY A WORLD-WIDE PARTS AND SERVICE ORGANISATION FOR THE 360,000 ENGINES IN USE

WRITE FOR INFORMATION
A FEW CHOICE DISTRIBUTORSHIPS OPEN

THE PETTER SMALL ENGINE DIVISION OF BRUSH ABOE, INC.
Office and Showroom 60-07 39th AVE, WOODSIDE, NEW YORK

"33,000 HOURS proved the choice was right!"

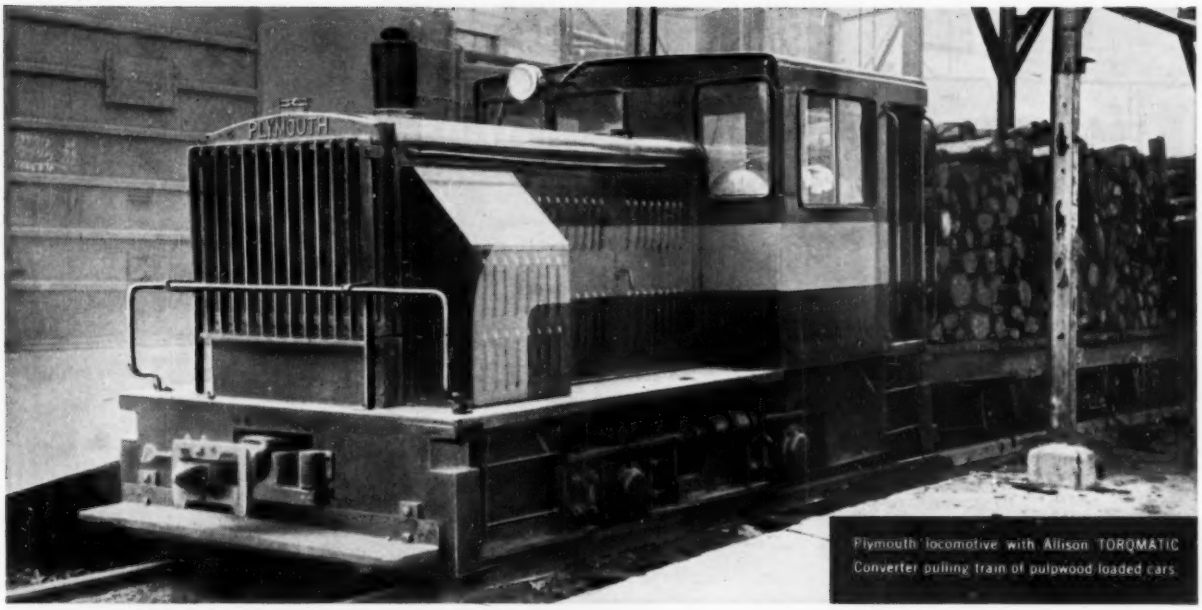
When a prominent North Carolina community converted its power plant to diesel operation, it called in Sinclair Lubrication Engineer Jim Holt for his recommendations on proper lubricants.

Mr. Holt reports, "I recommended Sinclair RUBILENE® My previous experience convinced me that this diesel lubricating oil would provide maximum wear protection for this power plant's six 1000 K.W. diesel engines. RUBILENE also guards against sticking rings and prevents excessive wear of cylinders, pistons and other moving parts operating continuously for long periods.

"RUBILENE was the right choice," Mr. Holt continues. "After 33,000 hours of near-continuous operation, bearings show very little discernible wear – and there's not a sign of erosive or corrosive action. *Oil consumption is remarkably low,* considering the prolonged operating hours under overload. All six 1000 K.W. engines, with a total output of 6400 K.W. per hour, *use a total of only 1 barrel of oil a day!*"

Why not give a Sinclair Lubrication Engineer the chance to help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS



Plymouth locomotive with Allison TORQMATIC Converter pulling train of pulpwood loaded cars.

Shock-Free Power Transmission Saves $500 a month

PRODUCTION jumped almost 100% when, in December 1950, *one* 18-ton locomotive equipped with an Allison Torque Converter replaced *two* 12-ton trolley-type locomotives owned by West Virginia Pulp and Paper Company.

Immediate savings came to $500 a month — the cost of a locomotive coupler. The trolley-type locomotives damaged an average of one coupler each month but smooth power transmission by the Allison TORQMATIC Converter eliminated this replacement expense.

And by November 1953, *savings in couplers alone* paid for a second Allison TORQMATIC-equipped locomotive.

Maintenance on these two units is "practically nil" because the Allison Converter automatically matches engine power to load demand, prevents engine lugging and drive-line shocks. Each unit uses less than 1 gallon of Diesel fuel an hour, pulls trains up 4½% grades, works an average of 16 hours per day.

Savings on Other Types of Heavy-Duty Equipment

Allison TORQMATIC Converters and TORQMATIC DRIVES cut costs and boost production in a wide range of heavy-duty equipment.

An Arizona mine gets 41% longer tire life on big truck tires costing $1000 or more each.

A Pennsylvania dragline operator saves $2160 a year on cable alone.

A western contractor gets 100% longer transmission life on off-highway trucks.

Get full details on TORQMATIC Converters, DRIVES and BRAKES for your units from your equipment dealer, manufacturer or write direct.

Allison Division of General Motors
Box 894S, Indianapolis 6, Indiana

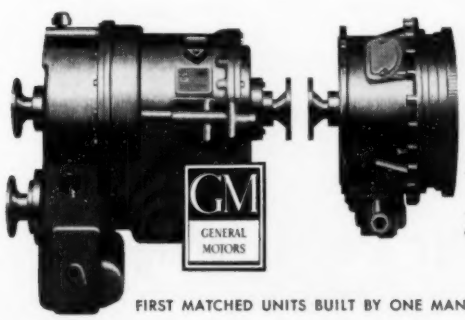
ALLISON TORQMATIC CONVERTER

Simple Design — one-piece cast converter elements — minimum maintenance

Compactness simplifies installation

Designed for power application in the 40 to 400 h.p. range

Longer Equipment Life — absorbs shock, eliminates engine lugging, cuts maintenance cost.



FIRST MATCHED UNITS BUILT BY ONE MANUFACTURER

Allison
TORQMATIC DRIVES

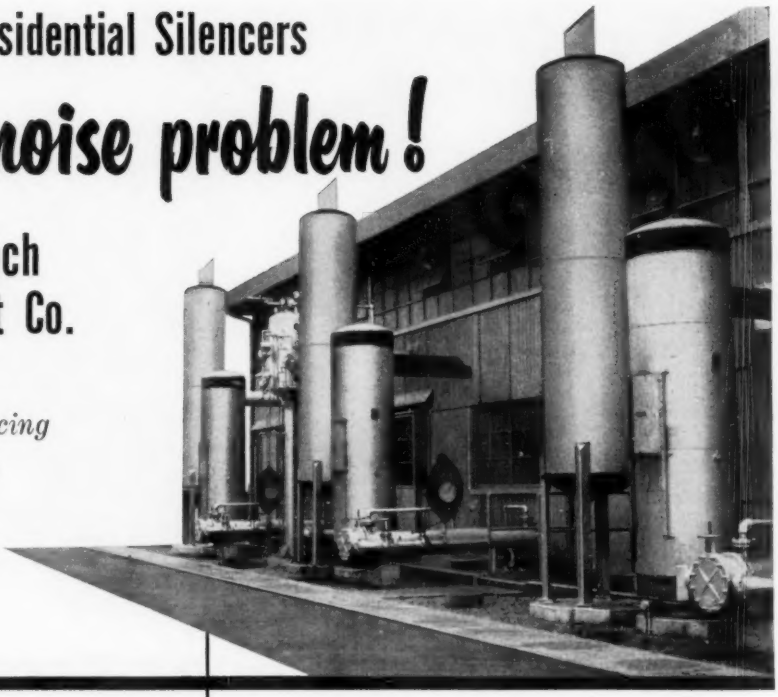
COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES
TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS

Kittell ECS-16 Residential Silencers

lick tough noise problem!

for Long Beach Oil Development Co.

Provide extreme silencing without reducing engine efficiency; prevent complaints from nearby residential area



When the Long Beach Oil Development Company built this recycling plant recently for the City of Long Beach, silencing the three Clark RA5 gas engines held top priority.

The plant is located close to the water's edge, directly across the bay from a large residential area. Since there are no natural obstructions to reduce the noise, good neighbor relations demanded maximum silencing of the exhaust gases.

To solve the problem, Kittell engineers recommended that each engine be equipped with a Kittell ECS-16, four-chamber residential-type silencer, modified for side inlet and equipped with mounting legs as shown above. These highly-efficient units were developed specifically for use near residential, hospital or other areas where extreme silencing is required. To date, not a single complaint of noise has been received.

ENTIRELY DIFFERENT DESIGN PRINCIPLE USED! As in all Kittell Silencers, the ECS-16 uses a unique method to control, and thus silence, hot exhaust gases. Kinetic energy in the moving mass of air guides the gases through a series of louvres, smoothing out the pulsations and producing a whisper-quiet flow. A special perforated tube quickly bleeds off the hot bursts as they enter the silencer, eliminating loss of power due to atmospheric back surge.

LONG LIFE; LOW MAINTENANCE! Large, free-flowing passages prevent plugging due to excessive carbon or sludge deposits. This feature and the rugged, heavy steel, all-welded construction, assure long life with minimum maintenance.

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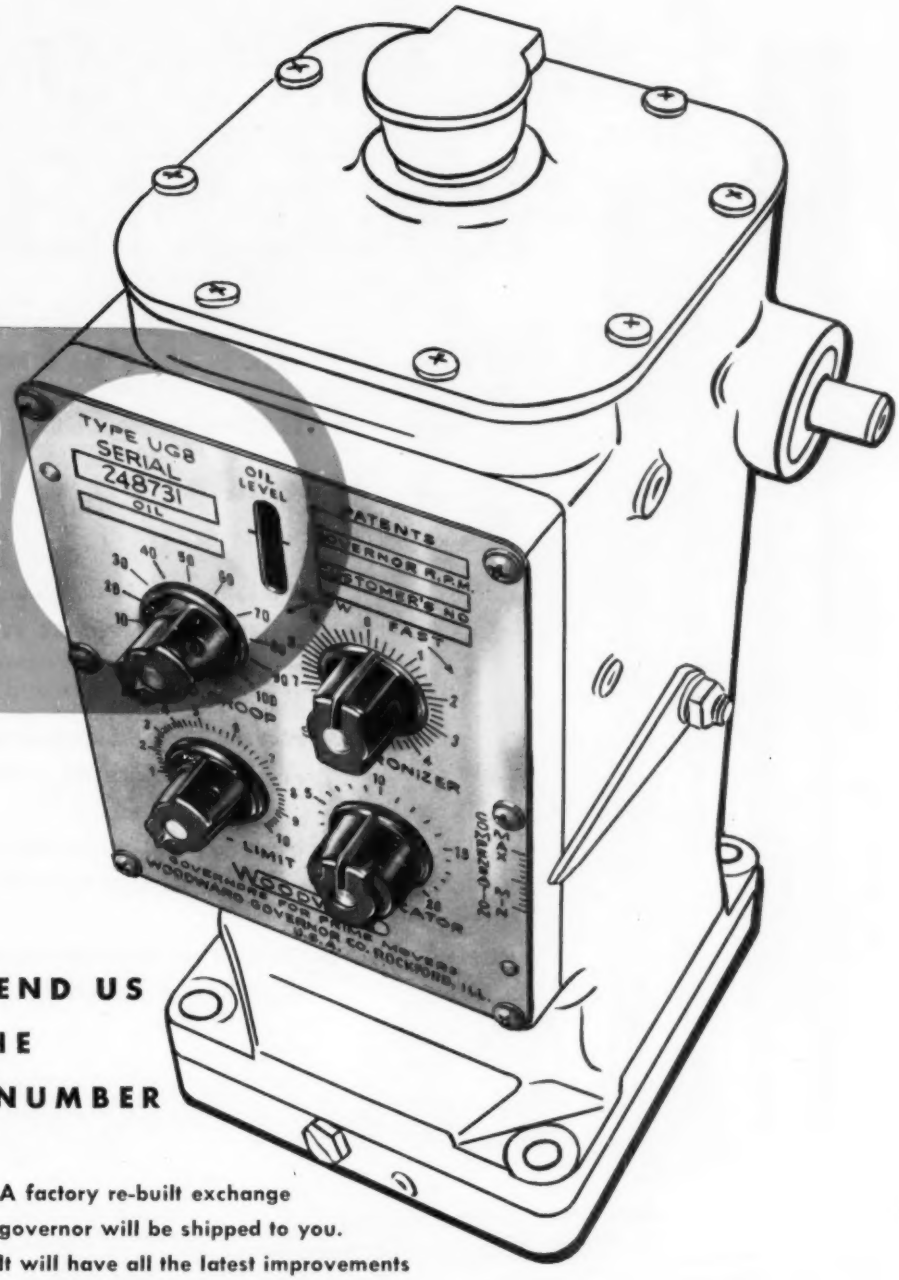
GOVERNOR EXCHANGE



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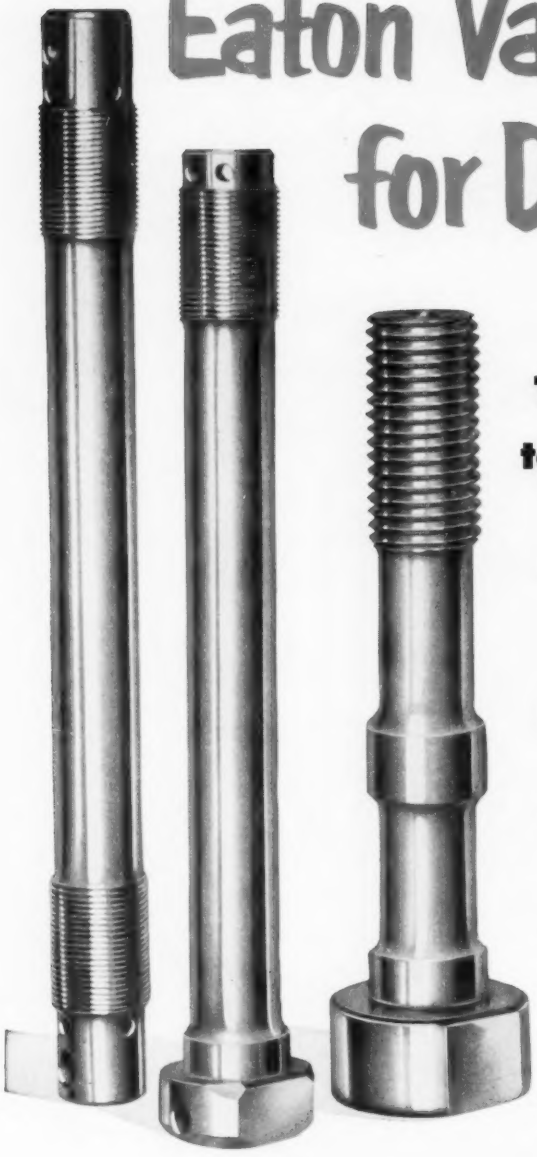

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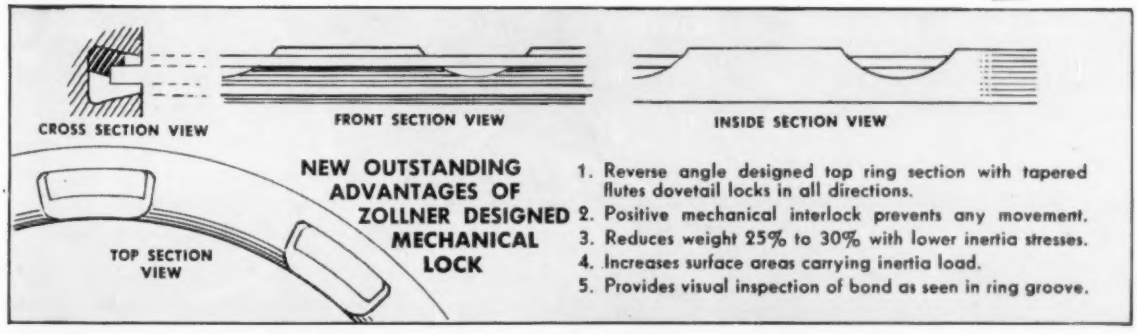

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EDWARD C. BALTZ
President
Perpetual Building Association
Washington, D. C.

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Let's point up this statement by Mr. Baltz, head of one of the nation's outstanding thrift institutions and volunteer chairman of the District of Columbia Savings Bond Committee, with a few facts and figures:

- currently, more than 45,000 companies, large and small, representing every classification of industry and business, are encouraging national thrift through the Payroll Savings Plan.
- every month, 8,500,000 Payroll Savers in these 45,000 companies invest more than $160,000,000 in Savings Bonds.
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This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

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True! After 15,000 miles per car—covering all conditions of city and country driving—Gulf test cars showed these results:

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New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE

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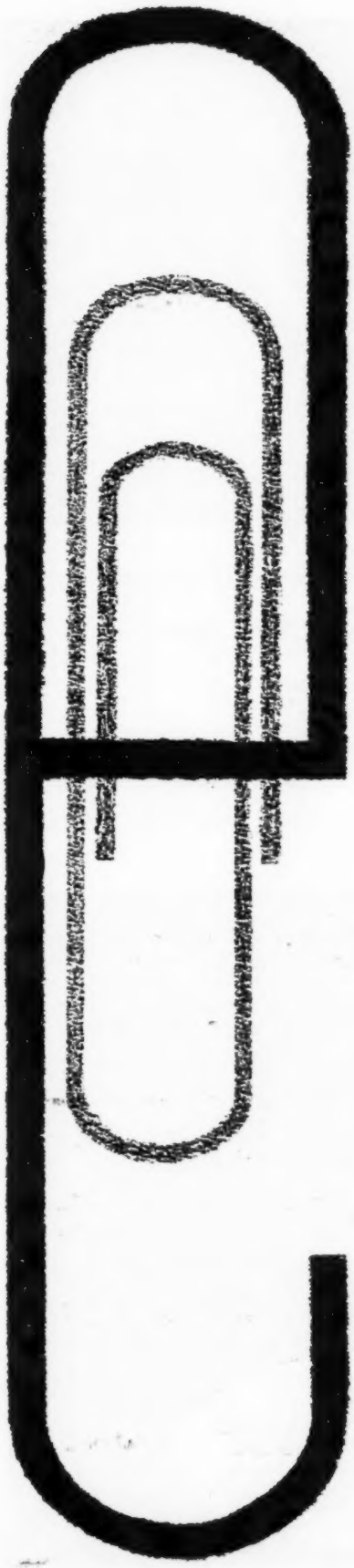

editorially speaking

Maintenance as a Philosophy

Jack Wetherell, our associate editor, came to us with a background in maintenance of heavy construction and earthmoving equipment. Recently, he walked into the office after tracking down details on a fleet maintenance story and commented, "Boy, I thought that I knew something about maintenance until I took this job and started tangling with some of these maintenance supervisors. Now I'm convinced that I only knew part of it. We worked under a system of preventive maintenance, periodic inspections, and a program of progressively heavier work on engines and engine units, until it was time for a major overhaul. Mostly it was a case of supervising to see that shop procedures were correct and that scheduled jobs were done on time. We prided ourselves on the quality of the mechanical work. Of course this is important, in fact, essential in any operation. But these fellows I meet are taking up where we left off. If the book said that we should get 6000 hours before a major overhaul, we were happy if we got it. These guys want to know why they can't get 8000- or 10,000! This gets the whole business out of mechanics and into a form of service engineering. They get into such things as longrange effects of fuel characteristics. Lube oils and filtration get a high-level going over. Same thing with air filtration. They study operation and its effect on engine life.

Every part of the engine and its equipment gets critical study. I've been surprised at the extent of interest and cooperation by the manufacturers too. Pretty soon they get to their 10,000-hour mark; bang! they up the ante. I can see now that maintenance is more than a mechanical practice; it's a sort of engineering philosophy."

Thanks for the editorial, Jack.

D.E.

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with
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No other piston ring material combines so many advantages as

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- Cyclan is Sealed Power's new alloy for extreme operating conditions.
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highlights

■ API tells us that crude oil is almost useless in its original state. However, the diesels which pump the crude to refineries so that hundreds of other products can be produced use filtered crude as fuel.

■ Of interest to those in the diesel industry will be the SAE's National Diesel Engine Meeting which is scheduled for October 26-28. The place—Statler Hotel, Cleveland, Ohio.

■ Too late for this year, but worth mentioning is the fact that the University of Nebraska wound up its Annual Diesel Operators Conference as we went to press.

■ Not too much has been said about the "radar islands" which the Air Force plans to build, but it seems like a logical market for diesel engines since many of these stations will be a considerable distance offshore.

■ Many of the nation's top industrial safety men and the latest safety equipment will converge on the Conrad Hilton Hotel in Chicago for a 5-day session of the National Safety Council. The dates—October 18 to 22.

■ GM recently introduced a new intercity-type bus powered by two Series 71 engines. Output of the two 4-cyl units is 300 hp at 2300 rpm. Each engine is mounted on an inclined angle, an end view of which is similar to a 140-deg Vee. Should one engine fail, the other engine can operate the bus, according to the manufacturer.

■ It was recently reported that the New Jersey Turnpike Authority is in the process of installing an apparatus called "Weathermaster". The purpose of the installation is to determine whether the unit, which was originally designed by Diesel Power Inc. of Pennsylvania for the prevention of frost in California orange groves, will be effective in blowing fog or smoke away from some areas of the turnpike.

■ Diesel fuel powers 80% of all railroad transportation, according to API. With many of the larger roads already fully dieselized, it would seem that the 100% mark is not too far off.

■ SAE will hold its National Transportation Meeting in Boston, Massachusetts, October 18 to 20. Theme of the meeting will be the recent trends in highway transportation. It will be interesting to note how the diesel fits into the picture.

■ A record-breaking attendance is expected by the American Road Builders Association at its annual meeting which will be held in New Orleans, January 10 to 13, 1955. The ARBA Supplies and Materials Division is sponsoring an Exhibit of Highway Materials and Supplies in conjunction with the meeting.

■ The use of diesel-powered equipment will not stop with the completion of the New York State Thruway. Emergency diesel-electric generator sets will be installed at each of the 27 service and restaurant areas along the route. Should normal power fail, the diesel-electric sets will take over.

■ It is reported that Gar Wood Industries is currently designing the world's largest ditching machine, capable of digging 15-ft wide by 30-ft deep ditches. The unit will reportedly be powered by twin diesel engines driving through torque converters. Also featured is hydraulic starting for the engines.

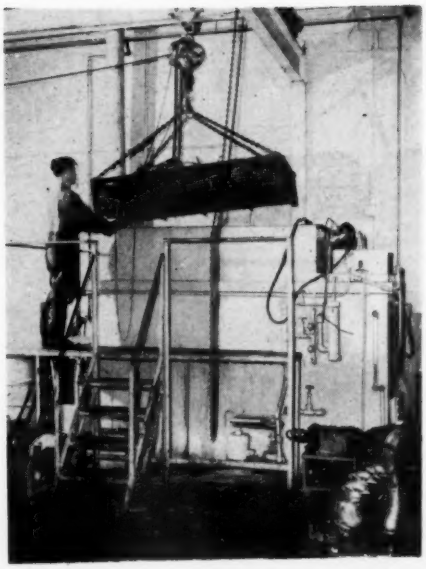
■ Development of the coal-fired gas turbine reportedly received a boost recently when Roy B. White, chairman of the board, B&O railroad, was awarded a patent for a device for cleaning final-stage turbine blades which become fouled with the tiny ash from the burning pulverized coal. Coal-carrying roads are in hopes the gas turbine locomotive, using pulverized coal as fuel, will be something with which to beat the diesel.

For the first step in the overhaul operation, the engine and transmission are placed in a roller-mounted cradle. After accessories are removed, the engine is placed on the tear-down stand.

PIE'S Cleaning Program

PIE estimates a saving of from $12 to $15 on each overhaul due to an efficient cleaning program. Multiply this by 252 units and you have a sizable annual saving.

By John W. Riesing
Director of Fleet Maintenance, Pacific Intermountain Express



Prior to inspection, all parts are cleaned. Here, a basket full of parts is being loaded into the vapor degreaser where fumes from heated trichlorethylene remove grease and oil.

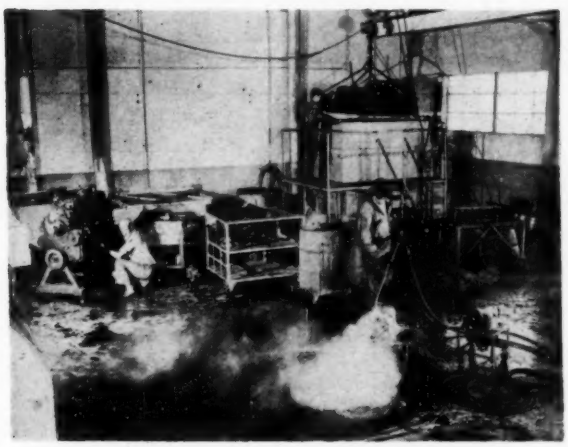
PACIFIC Intermountain Express operates about 252 over-the-road tractors. These are maintained for the most part at the company's Denver, Colo. shops where they are overhauled at intervals of approximately 180,000 mi. Since it takes about a year for a rig to chalk up 180,000 mi, complete overhauls are figured at one per unit per year.

If we, for the sake of argument, narrow the work week down to five days and then take out the holidays, complete overhauls approach the one-per-day mark. This does still not include the periodic maintenance due these units throughout the year.

Through experience, PIE has found that thorough cleaning of parts pays off in such an operation and have integrated an efficient cleaning program into maintenance and repair operations. Estimated saving per engine overhaul is $12 to $15, a sizable saving when you think in terms of 252 units overhauled per year.

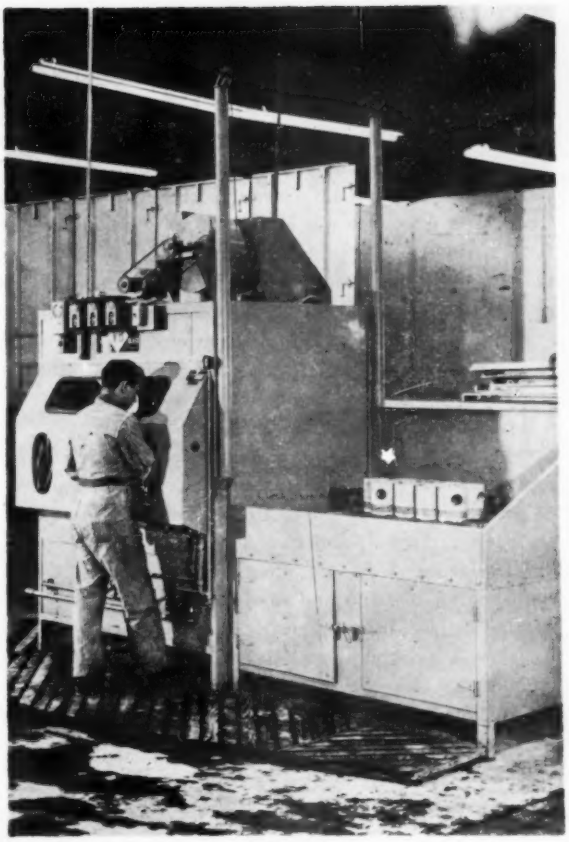
The 180,000-Mi Mark

When a tractor reaches the 180,000-mi mark, it is due for an overhaul and is pulled into the teardown bay of the steam room. Here the engine-transmission assembly is removed by a fork lift or overhead hoist, placed in a roller-mounted engine stand, and moved to another section of the steam room where skilled mechanics begin the process of complete dismantling.



Steam-cleaning equipment is also used on some of the parts after they emerge from the vapor degreaser. Depending upon the part, either steam cleaning or soft-grit blasting follow vapor degreasing.

Accessory parts such as transmission, pumps, etc., are removed first and placed in special bins or stands for cleaning. The engine is then moved by overhead hoist from the engine stand to the teardown stand. The latter is a specially built, manually operated stationary stand which permits the engine to be rotated into any position in a complete circle. It is on this stand that mechanics complete the removal of all component parts which, as they are removed, are recorded on the teardown sheet and placed in special stands or bins.



After cleaning in the vapor degreaser some parts, such as pistons, liners, valves and so forth, and cleaned further in the Vapor-Blast machine shown above.

From this point, parts (by the basketfull) are placed in the degreaser by means of an overhead hoist. The engine block is handled individually. This degreaser is actually a large gas-heated vat which is lined with a resin plastic and contains a trichlorethylene.

The vapors that come from heating the trichlorethylene remove all the grease and oil. Included in the degreaser equipment is a pump spray and nozzle which can be used to rinse the parts and the block as they are being removed from the degreaser.

When the basket is taken out of the degreaser, parts are either steam or vapor blast cleaned. Steaming consists of a thorough cleansing with a solution of steamer cleaning compound under 85-lb pressure. This removes all dirt deposits and carbon.

Pistons, liners, valves, and other such parts are then sent to the Vapor Blast machine for further cleaning. This process consists of air, water, silicon compound

(QUY 140), emulsion capsules (to keep sand from packing), and a rust inhibitor (metrolux), under 80- to 100-lb pressure. In this manner all carbon and rust deposits are removed.

All engine parts are next inspected for wear and damage. Some are rejected; others are sent to various departments for repair or warranty. Those which show no "wear and tear" are put back into an engine. To eliminate confusion, the parts are tagged with one of three colored tags which indicate whether they should be discarded, reconditioned, or simply put back in service.

With the engine and transmission removed, the tractor is further dismantled until only the skeleton framework remains. This frame, along with the cab, fenders, and wheels, are then steam-cleaned, after which they go through a sand-blasting process which removes all paint and dirt. This process consists of a commercial product (Carbo-blast) under 80- to 100-psi, which after use can be swept up, sifted, and reused.

Wheels and hubs are often dipped into the caustic bath before steaming and sand-blasting to remove much of the surface dirt, making the sand-blasting a much easier and quicker job.

Once the cleaning is completed, the framework, cab, fenders, etc., are inspected. If no repair work is involved, they are then ready for a new paint job.

Summary

It is estimated that the degreaser has cut the cleaning time in half. Formerly the block and parts received a 4-hr dip in a hot tank charged with a mild solution and then steam for three hours. This arrangement however did not thoroughly clean the block. With present equipment, oil and grease is cut in 20 to 45 min with only a few minutes required for steaming. Teardown hours have been reduced from eight to six and cleaning has been cut from six to one and one-half hours—and it is really clean.

Following cleaning and inspection, blocks and parts are taken to the engine buildup room. New parts from the stockroom replace those rejected or being reconditioned. And there you have it—less cleaning time, less downtime, and maintenance costs cut by $12 to $15 per unit.

Sand blasting equipment is also part of PIE's cleaning set-up. Parts such as wheel rims are often dipped in a caustic bath before sand blasting to shorten operation.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 97 to check them.

1. The principal effect of neglect of an oil bath-type air cleaner is
   a. increased wear because of more dirt entering the engine.
   b. increase in restriction in the intake air system with loss of horsepower.

2. When a precleaner used with an oil bath cleaner is neglected, the principal effect is
   a. decrease in the overall efficiency of the whole air cleaning setup
   b. need for more frequent servicing of the oil bath cleaner.

3. If a crankpin measures 0.006-in wear, it can always be reground to a standard 0.010-in undersize.
   a. True b. False

4. Which two of the following are the principal causes of trouble with hydraulic governors?
   a. poor adjustment c. oil oxidation products
   b. rough drive d. worn linkage
   e. dirt

5. If valve seats are ground several times, the valves drop too far into the head. Which of the following is a principal effect?
   a. lift is increased b. lift is decreased
   c. spring tension is reduced

6. A 30-deg seat angle on a valve gives greater tolerance to misalignment.
   a. True b. False

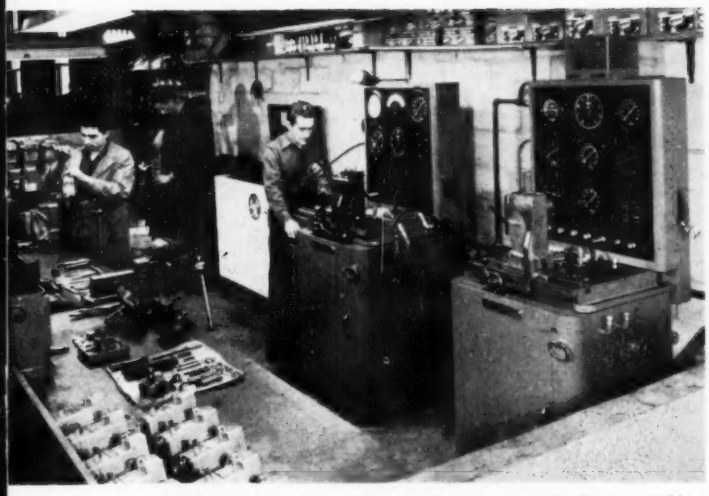
7. A pounded-out valve or seat is frequently the result of which of the following?
   a. high spring tension b. low spring tension

8. The reference from which all operations in valve reconditioning are figured is
   a. center of the old valve seat.
   b. centerline of the least unworn portion of the valve guide.
   c. centerline of guide as worn by previous valve.

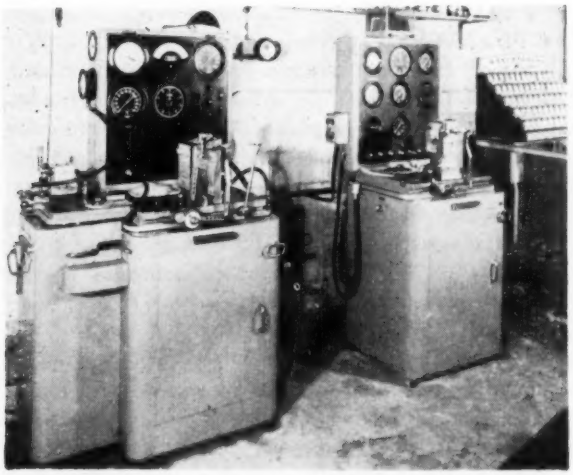
9. There is a definite relationship between exhaust temperature and horsepower in an engine.
   a. True b. False

Talking About Governors....

Here are some tips on how to avoid expensive governor repairs, things to watch out for, and some ideas as to what's involved in governor overhaul, all coming your way in the form of an interview with Jimmy D'Aversa, A&D Diesel Service, Inc., of Brooklyn, New York.



All facilities for governor repair are grouped. Cleaner (white tank) is behind test stands. Ample clean bench space with special tools and fixtures stored below adds to convenience of the work.



Governor test stand for pneumatic and electro-hydraulic units is at right. Stand at left is for conventional hydraulic units and it has special stand for automotive-type units attached at left.

"IN all our experience with injection equipment repair we had to learn something about governors too. Most multi-plunger and distributor-type pumps have mechanical governors attached. We take care of these at the same time that we overhaul the pumps. Now we are getting in a lot of hydraulic governors, small ones from the automotive-type engines, and the larger ones too.

"It seemed logical to round out our injection service by including facilities for hydraulic governor servicing. The governor is so tied up with the rest of the fuel injection system that it doesn't seem right to do each job independently. We've run into trouble on this before."

"How do you mean that, Jimmy?"

"Well, we've had cases where we did the injection pump work and had it thrown back at us because the engine didn't run right. Someone else did the governor work, or vice versa. It's only human to stick up for your own job and so right away there is a hassle. No matter who is to blame—and we can be wrong too—it's a tough situation. We'd rather be responsible for the whole job."

"You have a lot of test equipment and presumably others do too. How come you have trouble when the units are installed?"

"Your presumption isn't necessarily accurate, but in our case, yes, we have a lot of test equipment. We're set up to do a job on all injection equipment and governors. We have three calibration stands for injection pumps, one being for the large individual type; all the necessary nozzle testers; and what amounts to three governor test stands. The one for Woodward UG's, SI's and SG's, as well as Marquette and Pickering units, has a separate portion for testing Woodward SG's as used on Detroit Diesel and Cummins engines, and the PM's for Macks. The other stand is for the pneumatic and electro-hydraulic type of governors.

"Sure we test every item before it goes out, but a lot of things can happen. Take linkages. We have followed

up squawks on both pumps and governors only to find that the trouble was sloppy or binding linkages. With governors, sometimes it's the drive. We test governors without their drive gears. Some gears are not so hot; some are not given the proper backlash when the governor is installed; and sometimes it is the drive itself.

"In one case we had to rebuild a whole drive unit, rebushing shafts and taking out play, to prove that the governor was okay. They still complained. We sent a man to check and he found that they had two similar engines. The reconditioned governor was on one engine and the rebuilt drive on the other. With the two rebuilt units on the same engine, the trouble disappeared. The other drive needed rebuilding too."

"Do you think that some of these things lead to removal of the governor for repair when actually it is okay?"

"It probably happens, but I would say that it is never a total loss. We rarely get in a governor that doesn't need some attention. Consider it as a form of preventive maintenance and, believe me, some of the governors we get show that more of this sort of thing would be a good idea. And if it leads to the location of trouble, you're better off even though it might be the hard way."

"What sort of troubles do you find to be most common?"

"That's easy; dirt and oil oxidation products. Dirt wears and scratches the finely finished parts. The gums, resins, and varnishes coat the parts and make action sluggish. Cold sludges are found too. If people would learn to keep the oil clean and periodically flush out the governors as recommended, they wouldn't have much trouble with them.

"Another thing is paint. Some of these fellows must use a calcimine brush. They paint the housings, the fittings, the nameplates, output shafts, linkages, and on injection equipment, even the racks. It often causes binds and we find paint chips in the units. If they'd only take it easy."

"Just what is the approach to repairing a governor? Do you test it to find the specific trouble and just fix that?"

"No, we go right through the whole works. It's about like injection equipment, when it gets to the point of giving trouble on the engine, it's time for a complete check. The working of the parts is all tied in together and it is pretty tough to fix one thing without throwing the whole works out of kilter.

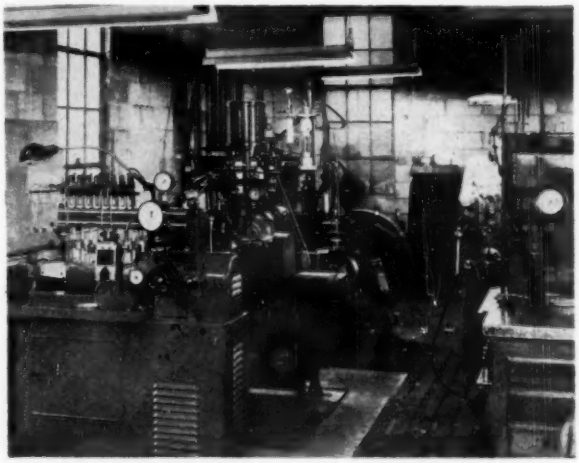
"We take the whole governor apart and clean everything in an air-agitated Bendix cleaner bath. Then we can really see their condition. We go over each piece critically and replace those that are either downright unserviceable or look as if they were reaching the end of their useful life. We automatically replace all ball bearings, gaskets, and seals."

"Isn't this wasteful, particularly in the case of bearings and the parts with remaining service life?"

"No. You don't overhaul a governor every day, and it is false economy to go through all the motions and then leave parts in that are liable to fail well before the governor is due for another checkup. And remember that a governor has to be sensitive to do its job. If worn parts or a little leakage here and there affect the sensitivity, governing action is sure to suffer."

"Then you just replace suspicious or bad parts and build up the governor again."

"Slow down, there is more to it than that. Even though it may be a hydraulic governor with or without pneumatic or electric controls, the basic job is still mechanical. It is just like injection equipment in this respect. Fits, finishes, and mechanical linkages must be just right if the mechanism is to control the hydraulic system that actually does the work.



Three pump calibration stands, two for the smaller units with the large one at the rear for big individual-type pumps. One of many nozzle testers is seen at right. Out of picture at left are both American Bosch and Merlin grinders for refacing nozzle needles.

"The condition of bushings, lineup of the cover and housing in the case of the PM governor, and similar mechanical items are all checked. We've made up tools for replacing bushings, and for some jobs special fixtures for line reaming so that all parts fit properly when put together. The first part of the whole job is precision mechanical work."

"And then you get to the testing. Right?"

"The basic governor is assembled, but some of the covers, levers, and so forth are left off. The governor is set up on the tester and we go ahead to check and adjust it."

"How do the testers work?"

"All of the testers are built to simulate actual engine conditions as far as possible. An air motor does the

A clean metal-topped bench gives plenty of working space for pump and nozzle repair. Variety of work is shown by Hamilton pumps in foreground, F-M nozzles behind with Bosch pump in vise.

driving, and it is controlled by linkage of the governor output to an air valve. Engine load increases are simulated by a brake. If governor speed is reduced by momentary brake application, it moves to increase the air and restore speed. In short, the governor controls its own speed for the particular setting. Then, by operating the governor controls as they would be in actual service, response can be checked.

"Of course this is an oversimplification. The test stands become pretty complicated to cope with the more elaborate governors like those used on railroad engines. Basic provisions include speed indication, a supply of lube oil at controlled temperatures, and an ample and controlled supply of air. Pneumatic and electro-hydraulic governors need considerably more.

"Where air or electricity is used for governor control, the conditions in the control circuit must be duplicated and instruments provided for checking. For instance, the Woodward SI railroad governors require a 64-v DC supply and a speed selector switch for the operation of the speed-changing solenoids. Then there is a solenoid that operates during transition (changing traction motor connections) to reduce the excitation of the main generator.

"Each governor, in fact the same governor in different applications, will have its own settings, and the necessary circuit, connections and instruments are there to check it out. That's why we found these three test stands necessary."

"Where do you get all your dope?"

"First, it's a question of men. We sent our personnel out to the Woodward school. They were good injection equipment men to start and were able to learn a lot. Then we keep in touch with the governor builders, take things that are bothering us to them, and get their specifications before tackling a job. Without the specs, you're working in the dark. As a simple example, governor rpm may be different when the same model is used on two engine makes. This dope would be on the name plate, but we sometimes find these missing or even changed. If you have the specs, you can check out the governor at its proper speeds."

"What sort of things do you find on the test stands?"

"Probably most important is the fact that the stand checks out the mechanical portion of the work. Say that the oil pressure in the governor is jumpy. This could mean a binding accumulator piston or a leak of some sort. Or take the case of PM's used on Macks. The injection racks are pushed to a "no-fuel" by a spring on the pump when the engine is stopped and the governor oil pressure drops. They depend on governor oil pressure to push them back into starting position. You've got to get your oil pressure at cranking speeds or it's no start. We can check this on the stand.

"Some fellows are doing the mechanical work on the governors and putting them on the engine to check them out. It's fine if it works, and in the final analysis the engine does the final judging. But if trouble develops, how do you know whether it's the engine or the governor? You can horse around a long time this way. When the governor checks out on the stand you can be pretty sure that the trouble is elsewhere. The most that you can need are some minor adjustments to match it to the particular engine.

"We are helping a fellow out right now. He overhauled a governor for a customer but didn't have a stand to check it. When it went on the engine they couldn't hold speed; the engine hunted. The engine owner blamed the governor and this fellow was in a spot. We checked the governor out on the stand and with a few minor adjustments it was okay. Now he has a basis to convince the owner that something else is wrong."

"Anything else, Jimmy?"

"I guess that that about covers it. I would like to make one more point though. The fellows in the field must realize that the injection pump or the governor is only one piece of a whole machine. You can't fix a beaten-up engine by overhauling one part. Also, the pump or governor must work properly with the rest of the engine. They took the equipment off the engine; it is their responsibility to put it back right.

"This will save everyone a lot of headaches. It got so bad that we had to start charging for our time. We stand behind our jobs and if we make a mistake, will make it good. But if we have to go out and time the pump or straighten out the linkage or the quadrant setting, we have to charge for it.

"These fellows will also save time and money if they apply preventive maintenance practices. And with both injection equipment and governors the No. 1 enemy is dirt. Keep it out of your equipment!"

Improving Air Cleaner Efficiency

*By David P. Eastman, Chief Engineer**
United Specialties Company, United Air Cleaner Div. Chicago, Illinois

AN increase in cleaner efficiency can mean greater engine life. For this reason, manufacturers of farm tractors and earthmoving equipment are paying close attention to the goal of increased air cleaner efficiency.

Efficiency

Tractor people use the term "efficiency" as the weight ratio between dust trapped and dust entering the air cleaner system. This is a convenient concept, but one likely to be misleading. Installations in use may, under actual field conditions, exhibit efficiencies in excess of 99%. Of course, no cleaner can exceed the limit of 100% and this fact leads to the delusion that as this limit is approached on a percentage basis, the air cleaner is nearly perfect and requires no further improvement.

The true criterion, however, is founded upon the amount of foreign matter slipping through the air cleaner and actually entering the engine intake. The problem becomes clearer when one forgets about air cleaner operation as defined above and thinks in terms of the total amount of dust admitted to the engine during a given time or distance.

Even though an air cleaner might have an efficiency of 99%, there are dust conditions around heavy machinery where the 1% of dust passing the air cleaner represents a destructive influence. If this efficiency can be raised for instance, by only 0.5%, the amount of dust passing to the engine will be cut in half, and the engine life may be greatly increased.

What To Do

There are only a few known basic principles for removing foreign matter from the air stream. None of these principles is new, and until such time as new processes are perfected, improvements in the way of cleaning the air stream must stem from combinations of the well-known methods.

Of the several known principles, three have been found particularly useful on tractors and other such heavy-duty machinery. These are the oil bath, inertia, and porus-wall types, the most important being the first. The following paragraphs will deal with each type in the order listed with interesting possibilities through new combinations of these various components developed and illustrated.

**Abstract of a paper presented by the author before an SAE National Tractor Meeting.*

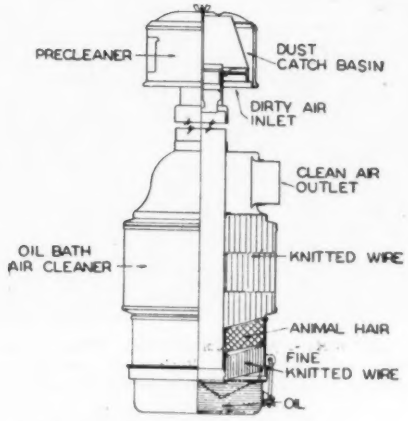


Fig. 1 One form of the conventional oil bath air cleaner. Overall efficiency and servicing periods are dependent upon interior design, such as density of the filter pack etc.

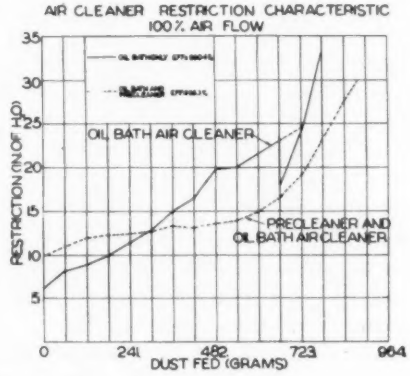


Fig. 2 Characteristic plugging as illustrated here by laboratory test, differs from field results where the air cleaner is mounted on a moving vehicle. Effect of air flow interruption is seen on the graph at 644 grams of "dust fed".

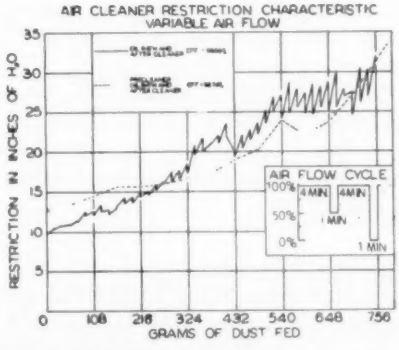


Fig. 3 Jagged line curve is characteristic of variable air flow. Drops in line are due to washing-back of dust on the filter media during interruptions of air flow through the filter.

Oil Bath Type

Fig. 1 shows a cross-section of one form of the conventional oil bath air cleaner, a form commonly used on tractors and other applications where severe vehicle movement is encountered. Efficiency of an oil bath cleaner is a compromise established on the basis of end use requirements. The basis for the compromise is the establishment of the highest possible cleaner efficiency while still retaining a practical service life for the unit between servicing periods.

Engineers attempt to secure at least one full day of service-free operation. By proper selection of the filter pack, almost any desired efficiency can be obtained, but an increase in efficiency is accompanied by a tendancy for lower dust holding capacity. It should be stated here, that the dust retaining capacity is limited by the air flow restriction which in turn, increases as dust accumulates in the cleaner.

It is possible however, to increase efficiency without reducing dust-holding capacity by segregating the filter material into separate layers having various densities and arranging these in a predetermined order of fineness. In the cleaner shown (Fig. 1), the lower 10 or 15% of the filter is fabricated from knitted wire, and the next higher 10% composed of curled cattle tail hair. Each of these filter sections is separately removable for ease of cleaning.

The lowest element exhibits good efficiency but allows free movement of oil, air, and trapped foreign material than the next higher element, thus serving to filter out the bulk of the material entering the filter and protecting the next higher element which is tighter and exhibits an extremely high filtering efficiency. The upper portion of the filter is filled with loosely compacted crimped knitted wire and serves as a reservoir for excess oil which has been drawn through the two lower elements.

Typical plugging characteristics of an oil bath cleaner, selected at random, are shown in Fig. 2, which was obtained from laboratory data. During the test, air was drawn through the air cleaner continuously at its rated air flow (80 cfm), and Standard Ordnance Coarse Test Dust, comparable to that encountered in normal field operation, was fed at a concentration of .025 grams per cu ft of air.

However, in actual field operation where the air cleaner is subject to vehicle movement and to variations and interruptions of air flow, washing of the baffle and filter mass takes place more effectively. The effect of air flow interruption, which illustrates the difference between static laboratory tests and actual field operation can be seen in Fig. 2 at 664 grams of dust fed. At this point, the test was interrupted to adjust certain equipment.

It should be noted that during this test, 781 grams of dust was fed causing an air cleaner restriction rise amounting to 27 in. of water. Air cleaner efficiency for the entire test was 99.04%. Translating this performance into a different concept by assuming incoming air to have an average dust concentration of .016 grms per cu ft,* an air cleaner in a hypothetical application would pass dust to an engine at the rate of 3.8 lb per 1000 hr. This figure is based upon an air flow rate of 189 cfm 100 hp as for a gasoline engine. Diesels normally receive even more dust due to the higher rate of air flow required.

It would be possible to repack this same air cleaner in a manner similar to that shown in Fig. 1, and thus greatly reduce the amount of dust to the engine. For instance, the filter might be selected to pass only 1 or 2 lb per 1000 hr. Of course, such an air cleaner would exhibit lower dirt holding capacity but its service free period of operation can be maintained by first passing the air stream through some form of inertia type air cleaner, which will reduce its dust burden to ¼ or 1/5 of what enters the system.

Inertia Type—One Possibility

The most common of the inertia type is the centrifugal precleaner, illustrated in Fig. 1 atop the oil bath unit.

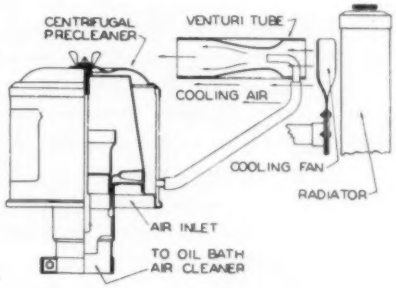


Fig. 4 Centrifugal precleaner arranged with a bleed-off tube to a venturi tube. Vacuum created by venturi draws off collected dust.

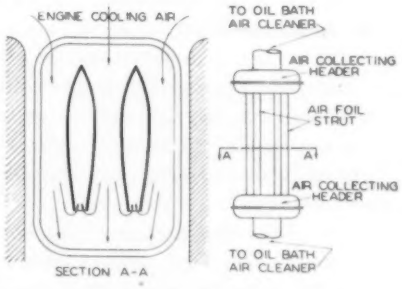


Fig. 5 Another type precleaner uses a series of air-foil shaped struts which work on a crack-of-the-whip principle.

A device of this type collects dust in its dry state, thus providing for very quick and easy servicing since only dumping of the dry material from the collecting chamber is required.

**DUST AND ITS EFFECT ON AIR CLEANER DESIGN, W. W. Lowther, S.A.E. National Tractor Meeting, September 1949.*

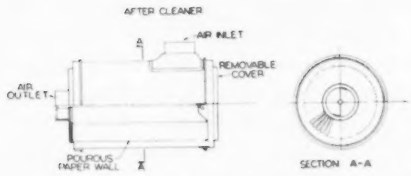


Fig. 6 Substantial porous-wall filtering units have been made from heavy treated filter paper by pleating long sheets and shaping the material into cylinders. A typical unit is shown.

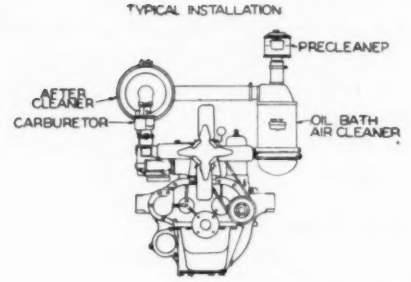


Fig. 7 Properly engineered, a 3-stage filtering system applied to either a diesel or gasoline engine as shown can increase air filtering efficiency.

Fig. 2 illustrates a combination of centrifugal precleaner and oil bath cleaner containing a special pack similar to that shown in Fig. 1. The physical structure of this air cleaner aside from the filter material was the same as that used to produce the solid line of Fig. 2. Note the tendency for the restriction to rise very slowly throughout most of the dust feed, a direct result of the greatly reduced rate at which foreign material enters the oil bath portion of the combination.

When the restriction reached 22½ in. of water above that of the clean combination, 882 grams of dust was retained, or 13% more than retained in the previous test by the oil bath air cleaner alone. Note, too, that the cleaning effectiveness of the combination was 99.63% or 1.48 lb per 1000 hr of dust entering the air induction system. Thus, through the use of this combination instead of just the oil bath unit, dust entering the engine will amount to only 39% of that entering through the protection of the standard commercial oil bath air cleaner alone. This added protection to the engine is obtained with even greater dust capacity.

When clean, restriction of the combination was somewhat higher than that of the oil bath air cleaner alone. This condition need not be, provided proper alterations of design are taken into account. In the case of the two tests herein described, for simplicity, the pre-cleaner was merely added to the same oil bath air cleaner structure with no alterations to the air passages of the oil bath other than a change of filter material.

It is an odd fact that the mere addition of a precleaner to an oil bath air cleaner with no alteration of the oil bath filter results in an overall efficiency less than that of the oil bath cleaner operating alone. Common practice has been to extend the service free operating period of an oil bath cleaner by this means, and the precleaner has suffered a bad reputation as a result.

Only through recognition of the oil bath cleaner as a single component in a two stage cleaning system wherein the filter of the oil bath is adjusted to fit the special requirements of the combination can the results of Fig. 2 be attained. With this approach to the problem, a system can be produced having either the efficiency of the conventional oil bath cleaner with longer service free operating period, an equal service period coupled with much higher cleaning efficiency, or any compromise between these two conditions.

A system of this sort is perfectly safe from the standpoint of engine protection and will be effective so long as it is given proper attention and service. Neglect of the oil bath air cleaner results in undue horsepower loss due to excessive restriction but will not contribute to excessive wear of the engine, since its efficiency tends to increase slightly with added dust burden. Likewise, neglect of the precleaner, although greatly shortening the service free period of the oil bath, will not contribute to engine wear, overall efficiency of the combination being wholly dependent upon the action of the oil bath air cleaner.

Precleaners of the centrifugal type also require service. Although cleaning of the precleaner is a cheaper and easier job than that of servicing the oil bath, under heavy dust conditions the operation may become rather frequent and burdensome. This objection may be overcome by devices which will effectively remove the entrained dust from the precleaner during operation of the machinery to which the precleaner and oil bath air cleaner are adapted. Fig. 4 illustrates one form of such a device.

Another self cleaning inertia-type precleaner is illustrated in Fig. 5. It consists of a series of air foil shaped struts, the ends of which are connected to headers. The headers, in turn are piped to the oil bath air cleaner installation. Engine air enters through the trailing edges of the air foil shaped struts which are left fully open. Such a precleaner installation, of course, requires no attention or service whatsoever and produces an efficiency of 76% based upon actual field tests.

Porus Wall Type-"Aftercleaners"

The foregoing discussion has dealt with two stage air cleaning systems in which the air first entered a precleaner and then passed on to an oil bath air cleaner. Still another form of the two stage cleaning system shows promise wherein the dirt laden air passes directly to the oil bath air cleaner, but between the oil bath and the engine air intake, an air cleaner of the porous wall type is introduced. A typical structure is shown in Fig. 6.

The oil bath component of this combination establishes the dust holding capacity of the system, and the porous wall cleaner, on the other hand, provides for an extremely high overall system efficiency by trapping the relatively small quantity of fine material passing out of

the oil bath unit. Porous wall devices used for this purpose have been referred to as "aftercleaners"; since they perform a secondary cleaning operation following the action of the oil bath air cleaner.

Laboratory tests similar to those previously described were made, results of which are illustrated in Fig. 3. Both tests were run using a variable air flow cycle as illustrated by the inset appearing in the lower right corner of the graph. The solid line shows the restriction characteristic for a combination commercial oil bath air cleaner and paper after cleaner, the oil bath being of the same construction as that used in obtaining the data for Fig. 2.

Restriction readings recorded on the graph, made under 100% air flow conditions, represent the total pressure drop through both oil bath and aftercleaner and were taken before and after each interruption of air flow. The jagged shape of the curve results from the washing back of dust accumulations in the filter of the oil bath air cleaner.

Again, the restriction of the system in a clean condition is relatively high due to the use of conveniently available air cleaner structures and interconnecting duct work. Care in design of the various components of such a system will result in satisfactory limits of restriction.

Now 3-Stage

The dotted line illustrates the restriction characteristic of a three stage combination including a precleaner, oil bath, and paper aftercleaner, the oil bath having a filter similar to that used in connection with the broken curve of Fig. 2. This test was run also on the same variable air flow cycle but for clarity of the graph, the curve was drawn only through the high points; i.e., the points taken before each interruption of air flow.

It should be particularly noted that the efficiency of the oil bath unit and after cleaner combination was 99.66% compared to 99.04% for the oil bath alone as shown in Fig. 2. Thus by use of the aftercleaner as a supplement to the oil bath, dust to the hypothetical engine is reduced from 3.8 lb per 1000 hr to 1.35 lb per 1000 hr. In other words, by using the aftercleaner, the engine will receive only 36% as much dust as it would with the oil bath air cleaner alone.

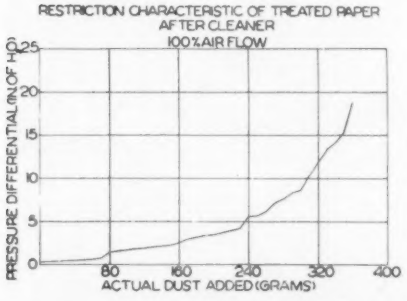


Fig. 8 Restriction vs. dust load characteristics for a paper or "after" filter.

In the case of the combination including precleaner, oil bath, and aftercleaner, an efficiency of 99.74% was obtained. Comparing this efficiency with that of the precleaner-oil bath combination of Fig. 2, dust to the engine using the paper after filter was 1.03 lb per 1000 hr as against 1.48 lb per 1000 hr without paper filter, or a 30% reduction of dust to the engine. By comparing the results of just the oil bath unit with that of the 3-Stage combination, it will be noted that 73% of the dust that would enter the engine from the conventional oil bath installation is eliminated by the combination, and this improvement in engine protection is accomplished without reduction of the service free period of oil bath air cleaner operation.

In both tests illustrated in Fig. 3, not enough dust entered the aftercleaner to affect noticeably the restriction of this unit which contained a paper element having an OD of 4⅞ in and a 9 in axial length. From the curve of Fig. 8, showing a typical restriction vs. dust load characteristic for the filter, it may be assumed that a load of about 0.5 lb is required to raise the restriction approximately 5 in H_2O.

If a 5-in H_2O restriction rise was taken as a basis, the after filter would have a life of 130 hr when used behind the oil bath alone, but would exhibit 340 hr of service in heavy dust conditions if used behind a combination including a precleaner and an oil bath having a special filter pack similar to that used in preparing the broken curves of Figs. 2 and 3. Although data concerning practical service life of the paper aftercleaner is not available, it may be possible to develop installations wherein the after filter will perform satisfactorily for one full season of farm operations.

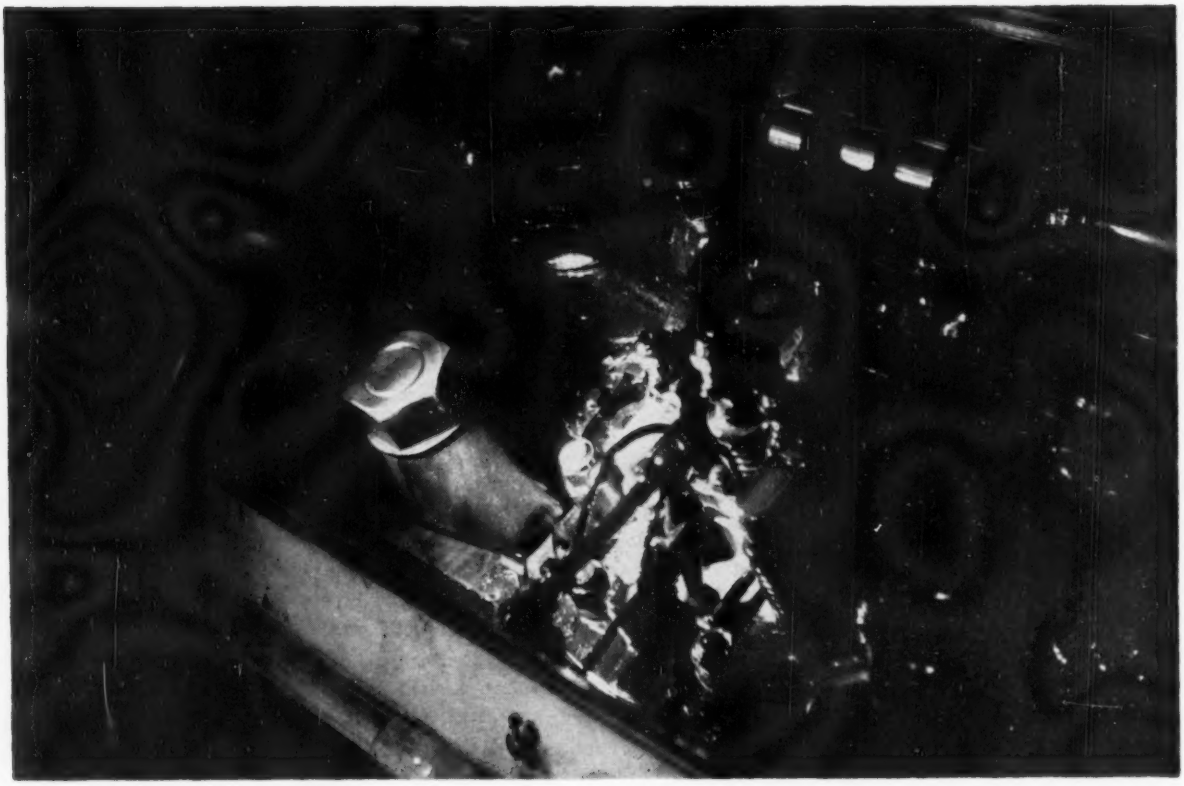
Summing Up

It appears evident from information given that much greater benefit is available from known methods for dust removal than is now being realized from commercial applications. Full benefit from existing principles can only be obtained by coupling two or more units in series, each stage in the series contributing its own particular feature to the system.

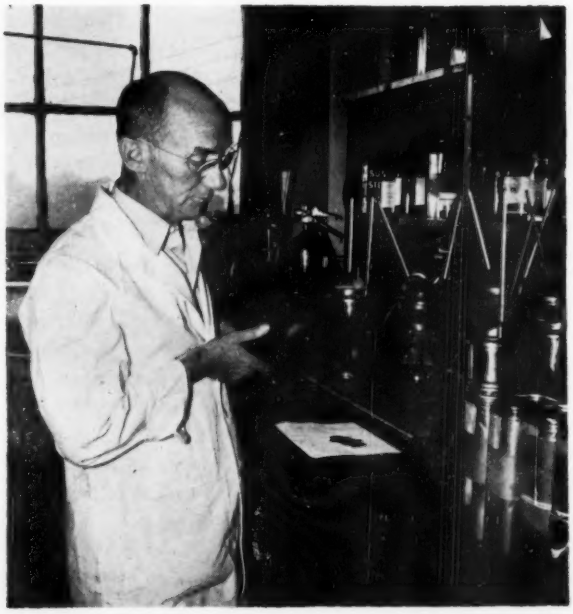
If the air cleaning equipment is to be expanded and composed of several separate units, even more attention to space requirements will be required. From the present appearances, an aftercleaner of the fluted paper type will require space somewhat comparable to that of the oil bath air cleaner with which it cooperates.

There are, of course, many tractors and machines now in service under heavy dust conditions which, due to space limitations, do not lend themselves to the application of three or even two stages of air cleaning. Where such is the case and there is need for greater air cleaner efficiency, careful thought should be given to the placing of the various required elements of the air cleaning system during the initial design period of the overall equipment. A suggested arrangement for a three stage air cleaner system is shown in Fig. 7.

Detecting Fuel Leaks With "BLACK LIGHT"



How the Southern Railway employs "Black Light" to find hazardous fuel leaks.



Black light has been used in the Southern Railway's test department laboratory to assist the claims department in determining the source of oil in oil-damaged goods. This is another of its many uses there.

EVASIVE fuel line leaks often pose a difficult problem to the maintenance man. This is especially true where lube oil is also present. An example of such a case is in the upper deck of the EMD engine where fuel lines and connections are usually covered with a film of lube oil, making it extremely difficult to distinguish between lube and fuel oil by ordinary visual inspection.

Standard procedure of the Southern calls for periodic lube oil viscosity checks. Where crankcase oil samples show an appreciable decrease, lube oil dilution is suspected. If dilution exceeds 5%, generally accepted practice calls for the crankcase to be drained and refilled with new oil. This can become expensive if the leak is not found and stopped since, depending on the size of the engine, between 165 and 225 gal of lube oil are required.

Finding a Leak

Under "black light" lubricating oil shows a light gray or chalky white, while fuel oil appears as a light milky-blue color. A Magnaflux ZB 26 Black Light is used for this purpose. It is a high voltage mercury arc light, equipped with a fluted violet filter which filters out all light rays in the lamp's beam except those in the near ultraviolet ray region.

The value of the lamp as an aid in finding fuel line leaks lies in the filtering action. The soft unfiltered violet rays bring out the natural fluorescence of the diesel fuel oil as contrasted with that of lubricating oil.

Formerly the practice was to wipe off the lubricating oil and watch for fuel oil leaks under a flashlight beam. Leaks were sometimes very hard to find, particularly in the close clearance spaces where fuel oil lines connect to injector. This method was time consuming and sometimes discouraging. Of course leaks in upper deck locations are not the only source of fuel dilution, but it is the easiest place to look and perhaps the quickest place in which to make repairs. With the new technique, either leaks are found in a fraction of time previously required, or it can be determined that no leaks exist here, and examination must be extended to other possible leak sources.

Magnaflux Black Light units have been used for many years in the Southern as well as on other roads, in Magnaglo testing process for detecting surface and near surface defects in diesel engine crankshafts, axles and other locomotive parts. This involves an electro-magnetic process in which chemically treated particles are attracted to a defect. Concentration of particles is detected with the aid of black light. Other shop and laboratory uses have also been found for it.

On locomotive diesels of the type, where fuel injectors are supplied by separate fuel injection pumps through a high pressure pipe line, little or no trouble is experienced in finding leaks since, in most cases, the high pressure causes a leak to spurt or spray. However, there may be leaks from other low-pressure fuel lines leading to injection pumps, or even from the pumps themselves, which may possibly drain into camshaft trough and back to crankcase, thus diluting lube oil.

Every principal shop on the Southern Railway, and any other point where it might prove useful, is now equipped with a Magnaflux Black Light unit for the sole purpose of examining diesel engine fuel lines. A "black light" check for fuel oil leakage is made regularly on all Southern engines. Any time fuel injector lines are disconnected for any reason, "black light" inspection is made for possible leaks, after pipes are again connected. Additional checks are made when the periodic lube oil samples show trace of fuel oil dilution.

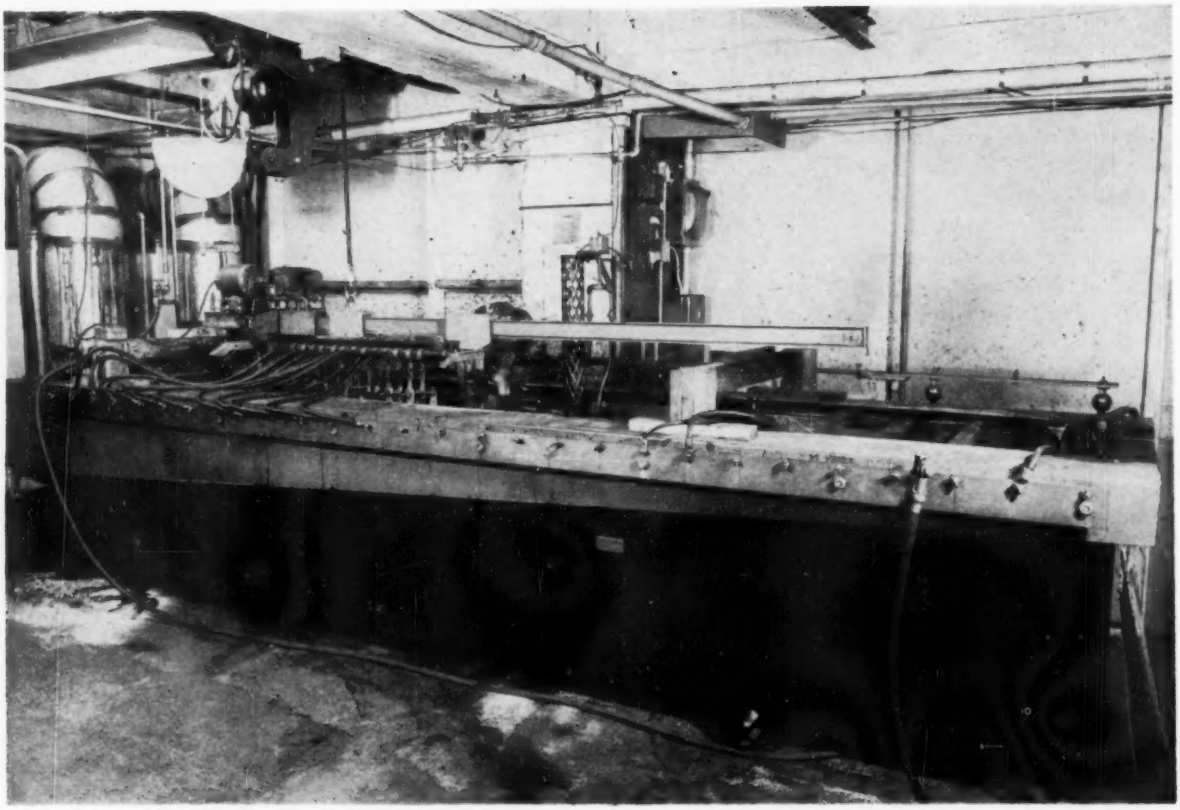
This new leak-locating technique was initiated by a test department technician on a routine visit to the Atlanta diesel shop. His attention was called informally to the annoying problem of finding fuel oil leaks in presence of lubricating oil. Knowing the qualities of "black light" to distinguish between different types of oil, and having with him a Magnaflux lamp used for another purpose at an earlier stop, he suggested its trial for this use.

On taking a look at a diesel engine awaiting shop, an unsuspected leak was found instantly at a fuel line-injector connection, which might not have been found by the former method of visual inspection.

Summing Up

Southern maintenance personnel are enthusiastic about the "black light" fuel leak detection method. One diesel specialist hailed this as, "the greatest discovery in the diesel engine maintenance field in the past 10 years." Other shopmen who used to spend hours searching painstakingly for fuel leaks with a wiping rag and a flashlight heartily approve this appraisal.

Here, a viscosity test is being run on samples of locomotive lube oil. If dilution has reached the 5% mark, crankcase oil is changed.



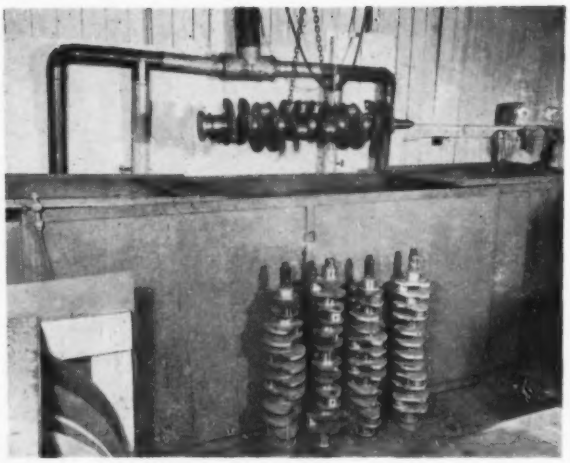
Putting on the chrome. Crankshaft in special fixture is submerged in the carefully-controlled bath. Note connections to bus and also hoisting mechanism. Tank heat controls are on back wall and ventilating pipes in left background.

Chroming Crankshafts

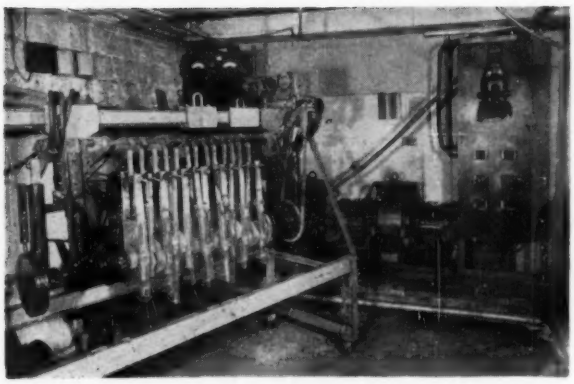
Successful reclamation of crankshafts by chrome plating depends on the techniques applied before, during, and after the actual plating application.

CHROMIUM is getting more and more attention as a surface finish for moving engine parts. Its extreme hardness (Rockwell C 66-70), its high melting point (around 3500°F), and its low frictional properties make it attractive. It can be made porous or channeled to provide oil retention as desirable for liners or it can be left "hard" as when applied to a crankshaft. While it will not wear well against itself, it has shown remarkable wear and abrasion resistance when mated with selected metals and has shown a marked resistance to galling or welding.

These qualities appear particularly attractive when considered in terms of crankshaft bearing surfaces for modern engines. High bearing loads dictate the use of the harder bearing materials which being more abrasive, require hard bearing surfaces. Also, the relatively poorer



Cleaning tank for hot alkaline washings is used whenever necessary. Clean parts produce best results.



Special plating fixture for holding and rotating crankshaft. On back wall are rotary converter (AC to DC) and control panel for plating power supply

imbedability of these bearing materials plus modern close tolerances, mean that there is more of a problem with abrasive particles.

Shafts reclaimed by chrome plating are proving the value of the process daily. Many are turning in phenomenal wear records. Why is it then that when the subject of chrome plated shafts is brought up (and other chromed parts for that matter), it is often met with the old "fish eye" stare?

The reason is that there is as much difference in chrome plating jobs as there is in ideas about what Eisenhower should do. Some people have not realized this and have been burnt. The fellow whose only experience with chrome plating has been with the peeling flash of chrome on the bumper of his new car might be expected to take a dim view of the process. Then take the case of the fellow who called up one day to ask, "Where can I get some diesel liners chrome plated?" When he was given a list of specialists in this work, his classic comment was, "Those are all out of town; I'll get some local shop to do it." He was asking for it and probably got it.

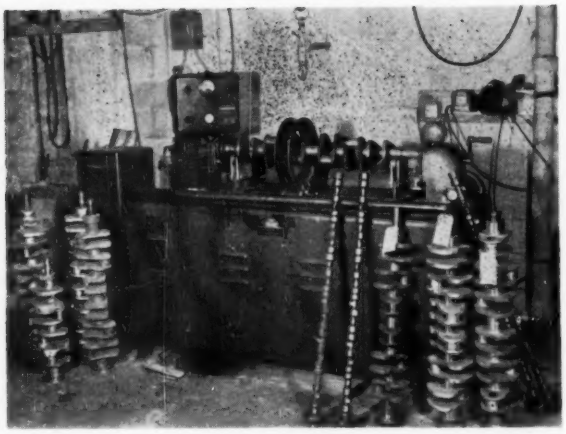
Good shops are taking part of the rap for such occurrences. But they are gradually overcoming skepticism by turning out good jobs that stay out. Also, a yardstick for evaluating a chroming job is being set up by spreading the word around about the steps required, techniques, and the equipment necessary. To help this work along, here is a description of the operations at one of the good shops—the Cleveland Hone and Manufacturing Company.

If you are in a hurry to get to the chrome plating of the crankshaft, slow down. The Smole brothers who run this outfit started off the description of operations with the Job Card. You get two-thirds down the card before you get to the first mention of plating. Then after a brief plating item there are a number of other steps listed. Later, after you see the process, you realize that the chrome plating is only one of a number of important steps that must be performed. Perhaps the whole thing should be billed as "Crankshaft Reclaiming with Chrome Plating."

Actually, the bulk of the job is specialized machine work. This is no problem to the Smoles who are set up for reconditioning connecting rods (those with precision-type bearings) and regrinding camshafts, up to railroad sizes, as well as crankshafts. Chrome plating is just an additional service.

Preliminary Work

Following down the Job Card is perhaps the most logical way to go through the process. Records we always have with us, so there are the usual spaces for entering



After initial cleaning, parts receive Magnaflux inspection. This is repeated after straightening (if necessary) and also after regrinding.

the "vital statistics", including the shaft serial number. The latter is to the shaft what dog tags are to a G. I., insurance against loss of identity.

A good dunking in a hot alkaline bath strips the shaft down for inspection. Magnafluxing checks out the shaft as being sound and worth additional work. When it gets over this hurdle, any gears or oil plugs are pulled. Oil passages get a preliminary cleaning.

Now, how about straightness? The shaft is recentered and the mains checked for runout. If straightening is indicated, this is done, after which the shaft is again magnafluxed. This may sound superfluous, but the Smoles have found enough evidence to indicate that the second check at this point is desirable.

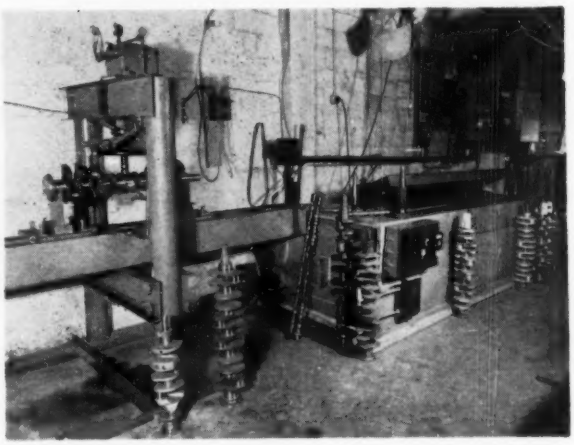
We might as well start talking about heat treating now; it will come up again. There are several reasons why heat should be applied to crankshafts during reworking. Residual stresses are one of the most important. Overheating of a bearing in service or the straightening operation may set up undesirable stresses in the shaft. An automatically controlled electrically heated oven is used here. Temperature is held at 500°F and the shafts allowed to "soak" out the stresses at this temperature.

The oven can accommodate several shafts of the sizes handled. Maximum sizes are limited by the capacity of the tooling and in this shop, the capacity provides for shafts with up to 10-in stroke, 24-in swing, and lengths up to 96 in. The crankshaft grinder is the principal limiting factor.

Grinding comes next. This shows up as only a little line on the Job Card, but it represents not only a goodly portion of the whole job, but is most important. There is no difference between grinding a crankshaft for chrome deposition or regrinding for use with undersized bearings.

Chrome will in a general way follow the contours and will not fill scratches or permit cleanup of an out-of-round journal unless an excessive amount of chrome is deposited. This is uneconomic and there is a limit to the thickness to which chrome can be plated without running into trouble. So all main and pin bearing surfaces must be ground straight and round. A good finish is also a "must" for a good plating job.

Another point is that the pins must be ground with surfaces concentric to the proper axis. If most of the wear is on one side of the pin (a usual condition), you can't just center on the least diameter and grind it round. This will throw off the stroke or the angular relationship of the pins. If you do it this way, depending upon truing up after plating, the result will be unequal thickness of plating around the pin.



All undesirable stresses are removed by heat treatment in tank at right. Straightening press is at left. Controls regulating "soaking" temperature are on oven front.

For best results the correct stroke must be established along with the proper indexing of the pin axes. Then similar grinding of the chrome plating will insure an equal thickness of the hard surfacing. But we are not through; there is still the matter of fillets.

The chrome does not add to the strength of the shaft, so the original metal must take all the stresses. Ordinarily, fillets will not be damaged and so can be left in their original state. All that is done is to fair in the radius with the surface of the undercut portion. Even if the fillet does need some cleaning up, a generous fillet can be allowed as the chrome will build up the bearing surfaces and extend the wearing portion.

Again, we get magnetic inspection. Grinding operations may have opened up minute cracks or flaws that were not previously apparent. It is a sort of insurance, first to the customer and then to the plater. The customer gets the benefit of a double check and the shop wastes no more time and money on an unsound shaft.

When all this is done, the shaft is washed again in a hot caustic bath. It is imperative that grinding dust be removed for all the surfaces. Plating is the next step and it is necessary that the shaft be chemically clean. Following the wash, the shaft is put back in the heat-treating oven where it is again allowed to soak at 500°F. The clean, dry, and completely oil-free shaft is now ready for plating.

Putting on the Chrome

Chrome platers never seem to be particularly anxious to give out all the details of art. Since most of the specialized processes of the type being discussed were worked out the hard way, they are probably justified in keeping them under their hat. In any case, details of the anode design, bath composition, ampere rates, etc., are not of vital interest to the user; he just wants a good layer, properly applied.

The externals include a plating tank commensurate with the size of the shafts (up to 96 in) being handled. The tank incorporates a jig which holds and rotates the shaft in the bath. Anodes of a proprietary design are placed around each of the bearing surfaces. Plating current is supplied to the anodes by a rotary converter. A very efficient hood and blower system evacuate any gases formed.

Shafts are first etched by reversing the normal direction of current flow. This sets up the surfaces to make a good bond when the current flow is returned to normal and the plating starts. Since chromium does not "throw", it will only be deposited in the areas immediately adjacent to the anodes. It is allowed to build up in excess of the required diameter to allow some chrome removal during final finishing to insure cleanup.

The minimum thickness of the chrome layer after finishing that the Smoles like to get is 0.006-in. The maximum is 0.010-in per side. All this is determined at the time that the shaft is first reground by sizing the bearing surfaces so that a proper thickness of chrome will be left when the shaft is finally finished.

Finishing Operation

One trouble with chrome plating parts subject to high stresses and stress reversal (such as a crankshaft) is that in the process some hydrogen embrittlement will occur. Unless something is done about it, it can lead to early failure. Heat treatment is the answer and so the shaft goes back into the oven for more soaking, this time at 400°F.

Now the shaft is ready for the finish grinding. It goes through the same careful procedure followed in the first grinding. After the mains and throws are ground to the proper dimensions they are polished. Included in this operation is finishing of the oil holes. They are smoothed out, given the proper radii, and polished.

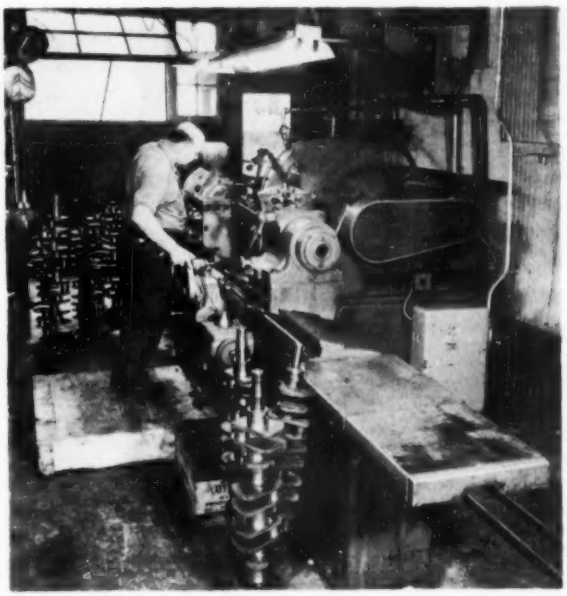
Using the journals as reference, the flywheel flange is now checked for runout. The earlier centering operation insures against radial runout so the face of the flange is checked. If any wobble is found, it is refaced. This is the first step in the final inspection. Magnetic inspection is again made and precision measuring tools are used to check for dimensional accuracy.

A final cleaning removes all abrasives and metal particles. Oil plugs and gears can now be reinstalled and after receiving a coating of rust proofing, the shaft is ready for delivery.

Buttoning Things Up

The purpose of going through this description of how chrome plating gets on a crankshaft is to emphasize all the considerations that go toward making a good job. It sets up something in the way of a yardstick. There are several firms that specialize in this work and while each will have his own ideas as to how to do each phase or may vary the sequence of operations, the methods used by Cleveland Hone are fairly typical.

There are no practical shortcuts. The shop must go through the same process as for a standard regrind plus a plating operation, an additional grinding, and heat treating. It will cost more than an ordinary regrind, but will be justified through increased length of service. This is if the job is done right. You now have some ideas on what's entailed; you be the judge.



Grinding takes place both before and after plating. It is a precision job which must be done properly in both initial and finish stages.

Special Tooling on The Reading

A look at some of the special tooling developed by the Reading to cut maintenance time and costs. Perhaps these ideas will save you some time.

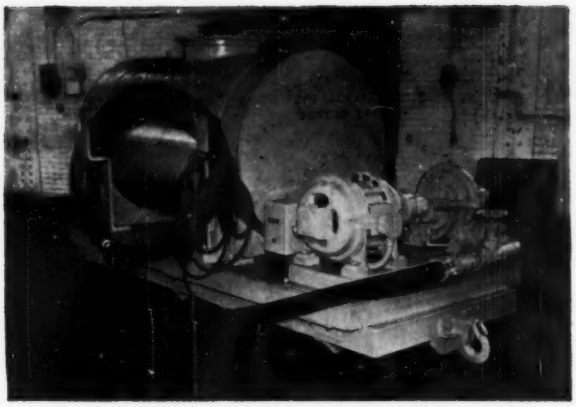


Fig. 1 Lube Oil Dispensing Truck and one other similar truck are used in changing crankcase oil. The two trucks, one empty and one filled with new oil, are pulled by a tractor up alongside of a locomotive unit. The empty tank receives the old oil as it drains from the crankcase.

This is followed by a flushing operation which consists of washing the dirt and sludge which have accumulated on the top deck of the engine, in the air box, and in such crankcase locations as can be seen from inspection hand holes with a fuel oil spray. This residue is flushed down the drain to openings leading to the tank wagon.

In the meanwhile, equipment on the other truck has been made ready for operation. The pump on the other wagon is then started and the charge of fresh oil pumped into the crankcase.

DURING the transition from steam to diesel railroad maintenance personnel were faced with many new problems. In many cases there was little in the way of precedent to guide supervisory personnel so that initiative and resourcefulness stepped into the picture leaving in their wake many specially developed tools and fixtures designed to cut maintenance time.

On the Reading as on other roads which were faced with the problem of maintaining mushrooming diesel fleets growing faster than maintenance men could be trained, the initiative and resourcefulness is still present and time-saving tooling continually being developed.

At the Reading locomotive shop a shop devices committee has been initiated by Mr. H. Hill, superintendent of Motive Power and Equipment, to investigate and develop special tooling. Organized and administered by Shop Superintendent F. L. Giehl as chairman, the committee consists of five shop foremen who meet at least once a week or more often when necessary. When working on a "hot" idea, one which promises a considerable advantage in saving work or in expediting an operation, the committee meets every day.

At present the Reading owns 355 diesel-electric locomotive units of various manufacture and 73 steam locomotives. Most of the latter units however are in storage.

Facilities

Reading's locomotive shop measures 204 ft by 750 ft and is of the transverse type. It was built in 1901, with a 192-ft by 404-ft machine shop extension added in 1905. The latter now houses a 60-ft by 404-ft electrical repair shop.

Of the 68 repair tracks in the two side erecting bays, 28 are reserved for repairs to steam locomotives, cranes, and miscellaneous equipment including motor cars and other M. of W. equipment. The remaining 40 tracks and necessary machine shop space in center bay are assigned to repairs of diesel-electric locomotives and component parts.

Very little modification of the shop itself has been made other than the boarding-up of track pits between the rails as will be noticed in some of the accompanying pictures. Most of the changes made have been in the provision of suitable benches, racks, stands, jigs and fixtures, and machine tool modification for work on diesel locomotive parts.

Two overhead cranes of 150-ton and 225-ton capacity serve each of the two erecting bays, while cranes of lesser capacity serve the machine and electrical repair shops.

Some Developed Ideas

Following are descriptions of some of the equipment, tools, and devices made up in this shop to save work and expedite repair operations. While these are only a few of the things devised, they are perhaps typical of what can be done to cut maintenance costs.

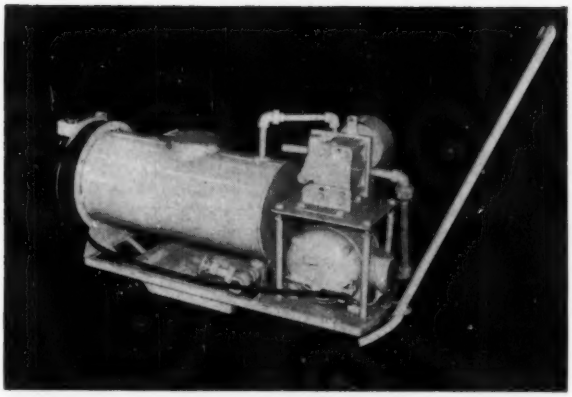


Fig. 2 Pre-Lubricating Truck consists of a tank holding a supply of new lube oil, an electric motor operating a pressure pump (from an old Cummins diesel engine), all mounted on a hand truck.

A connection is made to the engine lube oil pressure system at a convenient external location from an outlet on the back of the pump. Oil under pressure is then forced into the lube oil header and all connections leading to the main, crank pin and wrist pin bearings, piston cooling system if different from wrist pin oiling system, camshaft, and to rocker arm bearings. When oil is observed flowing from all these places it indicates that oil is flowing through the system without restrictions. The crankshaft is then barred over for at least one revolution to insure that oil reaches all moving parts.

This system is applied to newly overhau'ed engines regardless of whether they are to be installed in a unit immediately or placed in storage for future use.

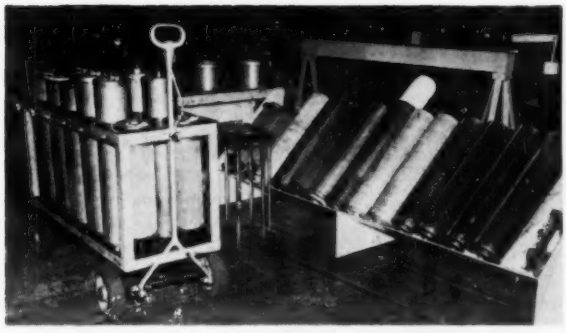


Fig. 3 Lube Oil Filter Wagon and Rack was designed for one-man handling. The wagon may be used for dirty elements just removed from the main filter housing on the locomotive or for hauling a set of filter casings (cans) to the locomotive unit after old "sock" elements have been removed from the cans, the cans cleaned, and new refills inserted.

Note the thumb screws in the top side rail of rack. These secure cans in place permitting one man to remove covers and pull dirty elements. Cans are then put through a cleansing bath and placed in the rack at right. The inclined position makes it easier to insert a new element.

The wagon may be used for various makes of cans and for suction strainers used in one type of engine. A 4-element cradle for Michiana housings, rests on the floor between the wagon and inc'ined rack.

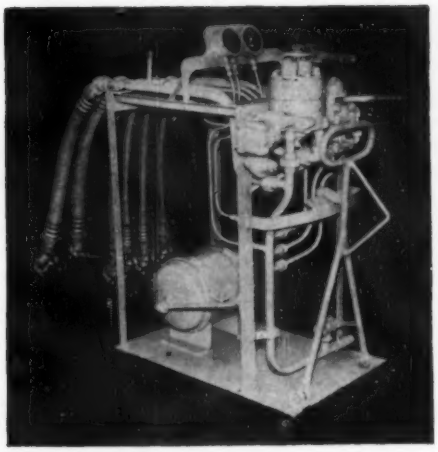


Fig. 4 Portable Air Test Stand for testing "B" units when no "A" unit is available. This unit permits the routine testing of air brake apparatus, signal air devices, sanders, bell ringer, and control air pressure.

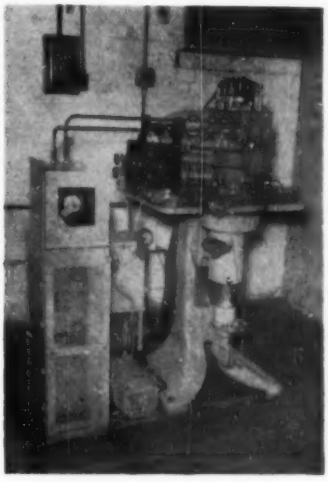


Fig. 5 Governor Test Stand is for testing Woodward governors. The stand only was obtained from the Woodward Governor Company after which it was fitted-up completely by the Reading. Equipment consists of a load regulator as used on one model of EMD locomotives, lube oil pump and oil heating tank, throttle control with dial running positions (black box), and a vertical air-motor driven speed shaft whose speed is regulated by the governor power piston. Gauges on the back panel indicate oil pressures required for testing governor operation.

A small motor-generator set mounted on the wall adjacent to the stand furnishes DC at 64 volts for operation of governor speed setting and control solenoids.

Fig. 6 Temperature Control Switch Test Stand tests adjusts thermostatically actuated electric switches which automatically regulate the operation of shutters and circulating fans controlling air movement through engine cooling water radiators in accordance with the temperature of engine jacket water.

Note the test thermometer sticking out of the top of the water reservoir, the ends of the heater elements, and control switch at right.

Fig. 7 Power Wrench consists of an air motor, standard air pressure feed valve, gear ring, air pressure gauge, control and reverse valves. This is used to remove and/or tighten cylinder head nuts and crab stud nuts. Torque can be properly controlled by careful setting of feed valve at time of calibrating torsional power of the wrench. The power wrench is shown in place over the diesel engine for removing cylinder head and crab nut studs.

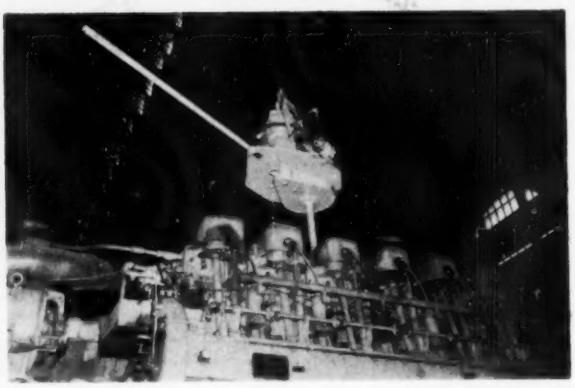
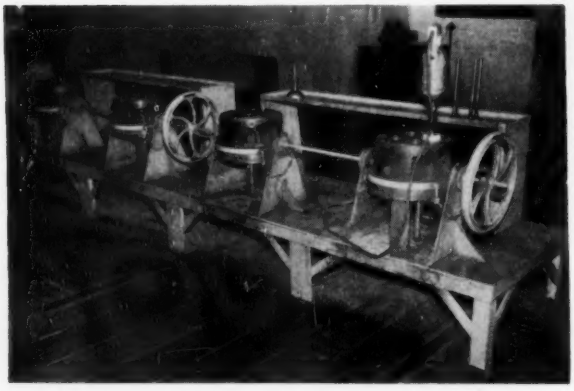


Fig. 8 Cylinder Head Stand and Jig holds heads (four at a time) either side up or in any desired position while reconditioning work is performed. All four heads are turned at the same time.



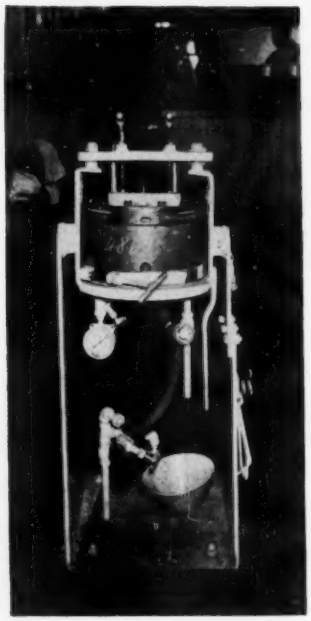


Fig. 9 Cylinder Head Test Stand applies a hydraulic test pressure of approximately 45 psi to detect possible cracks in the wall's of the water jacket. Water inlet ports in the bottom of the head are blocked by a gasket as the head is clamped to the supporting plate. Side outlet ports are blocked by a circular clamp shown in loosened position.

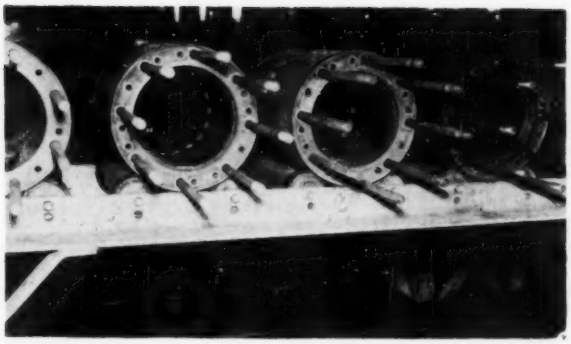


Fig. 10 Liner Inspection Rack holds cylinder liners in a horizontal position on rollers at a convenient height from the floor for easy but careful inspection to determine condition of the bore, whether walls are scored, measurements of wear, evidence or cracks, or other defects. A portable light placed on the side of the rack opposite the inspector aids in examination. Liners may be easily rolled over for examination of entire circumference, inside and outside. Liners are not rebored to oversize ir this shop. If repairs are needed, liners are sent to an outside concern for boring, chrome plating, and finishing to standard size.

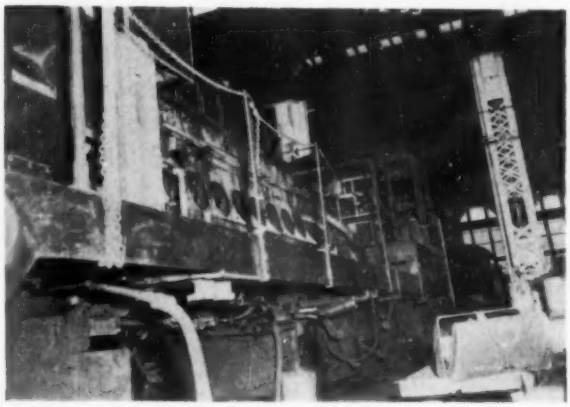


Fig. 11 Shop Safety Railings protect workmen while working on an engine or other parts above the runningboard. The portable railings save them from falls.

One end of the chain guards may be unhooked and lowered. if desired, for handling heavy or bulky parts from the runningboard.

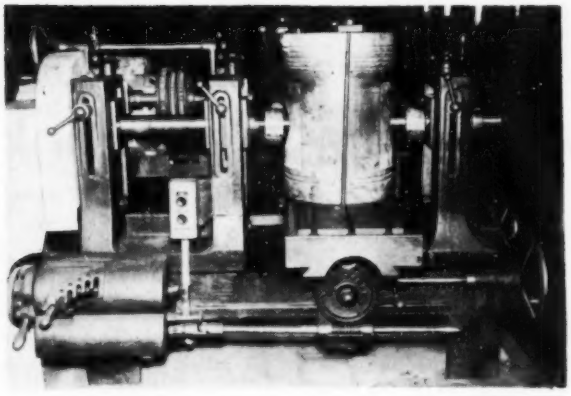


Fig. 12 Piston Reboring Jig, a modified milling machine, bores piston pin holes and end plate fits as required. Another operation done on this machine is cutting the slot for piston pin end plate dowels by inserting an end milling cutter in the chuck on the end of the drive shaft and milling one side at a time.

Fig. 13 Armature Application Bar is used for horizontal removal and replacement of traction motor armatures. End of bar is bored out to fit over the end of the armature shaft.

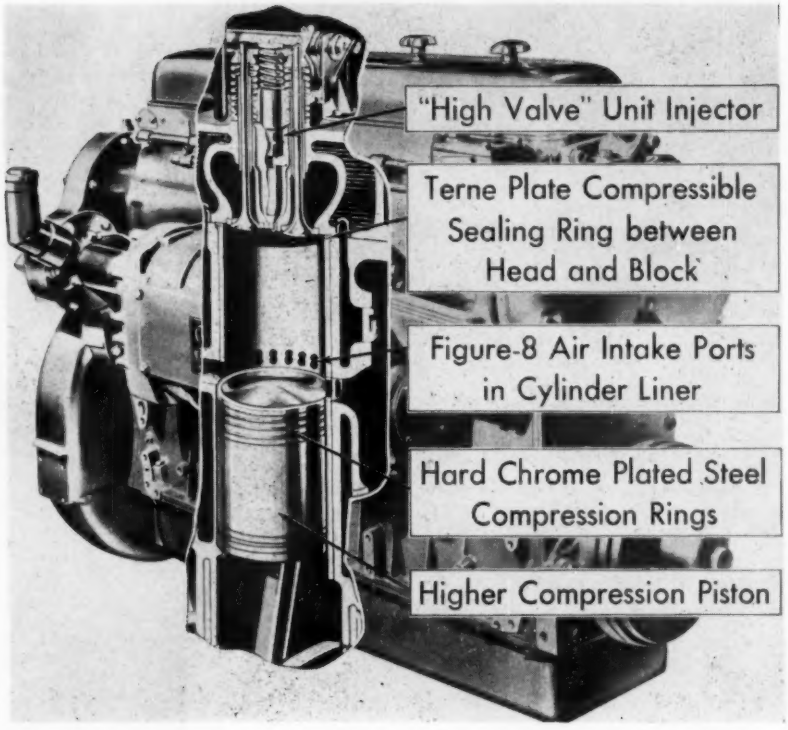
Another method practiced in some other railroad shops is to place the motor on the end and then lift or lower the armature vertically by a direct hitch to the crane hoist.

Reading peop'e prefer the horizontal position as most repair operations on the motor frame are performed while it is in this position. The same procedure is followed for handling main generator armatures.

Summary

These are only a few of the devices, tools, and procedures developed in a few short years by one wide-awake, resourceful, and imaginative railroad maintenance organization. More ideas are being explored and many of them developed currently, some originating through an alertness and desire to know what others are doing. This attitude is essential not only to a railroad but to any other maintenance shop if economical operation and maintenance costs are to be obtained.

Adding to earlier modifications, the GM "71" Series cylinder assembly has now undergone further refinement.


"High Valve" Unit Injector
Terne Plate Compressible Sealing Ring between Head and Block
Figure-8 Air Intake Ports in Cylinder Liner
Hard Chrome Plated Steel Compression Rings
Higher Compression Piston

GM "71" Cylinder Assembly Has New Look

SINCE World War II, a continuing program of refinement has been applied to Detroit Diesel's 71 Series engine. Externally there appears to be little change, but detailed examination of the parts—and a performance check—indicates that something new has been added. A whole series of modifications, some previously announced, involves what might be called the power assembly.

Design objectives were to obtain better engine breathing for increased power output and lower fuel consumption. Also, improvement in service life of parts was sought. All modifications were made with the idea of maintaining the highest degree of interchangeability of the new parts with the old so that engines in the field could be updated when undergoing overhaul.

Since all the modifications to be discussed concern the power assembly, let's start by reviewing some of the earlier changes.

Block and Head Sealing

Cylinder sealing was improved by the introduction of the metal-to-metal fit of the head and block (DIESEL POWER, September, 1951). Sealing at high compression with the old style laminated head gasket is a problem as builders of today's cars are finding out. This change eliminated possibility of trouble when compression was increased.

In this change the block and head were strengthened and the block made 1/16-in higher to compensate for the missing gasket. The block face was grooved and counterbored to accommodate individual oil and water seals of synthetic rubber. The liner flange counterbore was deepened to take a ring-shaped insert. The liner flange rests on this insert. A laminated compressable ring-type gasket goes between the liner and the head. All gaskets are compressible within the dimensions allowed so the rest of the mating area has a metal-to-metal fit. This allows the maximum load to be concentrated around each compression sealing surface.

Valve Mechanism Changes

Earlier changes also included a revision in exhaust valve timing and a switch from a 45-deg valve seat to 30 deg. The latter was effective in smoothing out gas flow and also provided more flow area for the same lift.

Simplified and improved rocker arms were also adopted.

High Valve Injector

Modification of the unit injector was announced earlier this year (DIESEL POWER, April 1954). While the design was not altered basically, the injector valve was moved upward in the injector body by alteration of the parts. The effect was to move the valve spring further from the high heat zone and by keeping it cooler, increase its life.

At the same time a simplified one-piece injection plunger follower replaced the former model. Production injectors incorporate these changes. The new follower assembly and the shortened barrel and plunger assembly are also the standard for all replacement. Following out the idea of interchangeability, two kits were provided. The first permitted the new parts to be used in existing injectors without alteration of the valve location, and the second—with all necessary parts—permitted conversion of the injectors to the new high-valve type. Furthering interchangeability, the new injectors, converted high-valve units, or the older model injectors with the adapted short barrel and plunger assembly, can be mixed up and used in any combination in an engine.

Piston Rings

The last of the earlier modifications that we will cover here are the "Lite-Tite" compression rings. These feature hard chrome plate on steel. The steel body is considered tougher and more flexible (for conformability) than those used earlier. The chromed faces show great resistance to abrasion and also to corrosion, all adding up to longer life.

Now let's get on to the new modifications that have added to the efficiency of the power assembly.

New Liner Porting

The new liner's port belt shows 20 "Figure 8" intake ports compared to the 15 circular ports of the earlier model. This provides approximately 30% greater air intake area. The new ports are drilled at a 25-deg angle compared to the prior 30 deg, to improve the swirl action of the incoming air. Swirling continues throughout the compression stroke and the turbulence promotes better combustion and improved scavenging.

The combined effect of the increased intake port area and changed port angle is freer breathing which is a major factor in improving fuel consumption and getting higher horsepower.

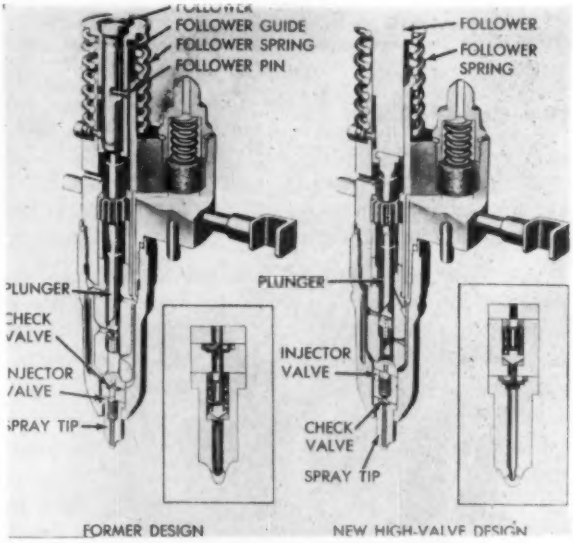
Liners are sand-cast, carefully machined, and then heat-treated. When the bores are ground to size they are honed. The result is a smooth long-wearing scuff-resisting surface.

Piston Changes

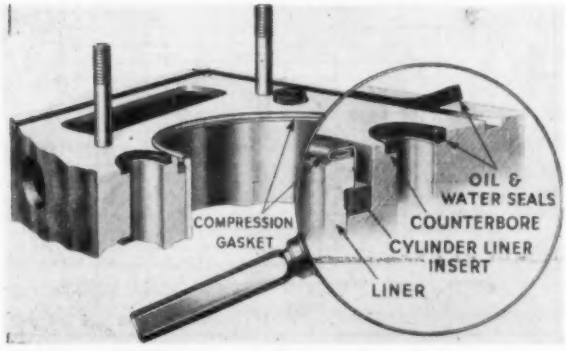
Pistons are still cast of high-tensile malleable iron, tin-plated to discourage scuffing and for better wear qualities. Three changes have been made however. The size of the dome crown cavity has been altered to compensate for the increased intake porting area. This permits more energy to be utilized from the fuel burned.

By using an increased radius at the outer edge of the dome cavity, heat flow toward the cooler portion of the piston was improved. This ties in with the proven interior design with its fin-type ribs and radial struts that have been effective in transferring the crown heat to the cooling spray of lube oil beneath the piston.

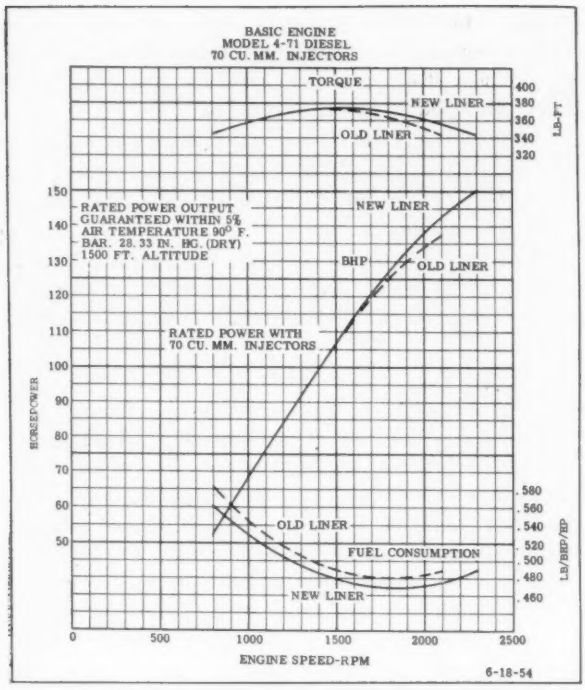
Another change involves the piston pin retainer and the piston pin. The new retainer is a disc with a diameter slightly larger than that of the bore in the piston. When pressed in, it dishes and holds the retainer in place without snap rings. The dishing of the retainer requires that a 15-deg chamber be made on the ends of the piston pin so as to provide the necessary clearance.



High-valve design was made by internal changes without altering outer contours or characteristics. Result—interchangability.



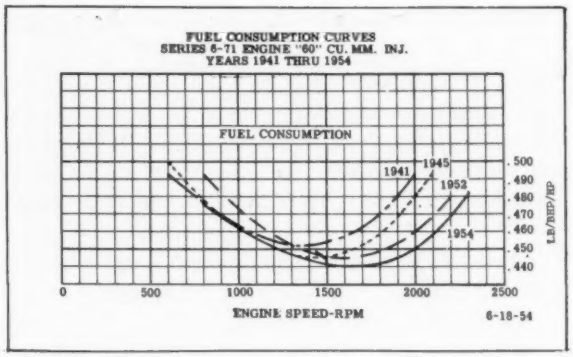
Metal-to-metal method of sealing between head and block concentrates maximum load around each compression sealing surface.



Improvement in performance of the 4-cyl engine resulting from modification of the porting in the liners.

New Cam Follower

Modification to the cam follower was simply to cut an angle on the inside of the roller support legs. While this might be considered minor, its purpose was to improve lubrication of the cam roller and thus increase both cam and follower life. The essence of good engineering is to achieve a result in the simplest possible way. This is one of those cases; a minor machine job gives major results.

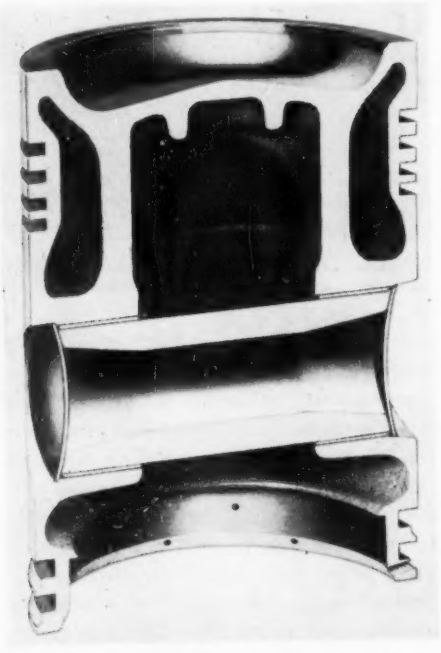


Refinements producing better fuel economy are a direct payoff to user. Note how minimum consumption moved up in the speed range.

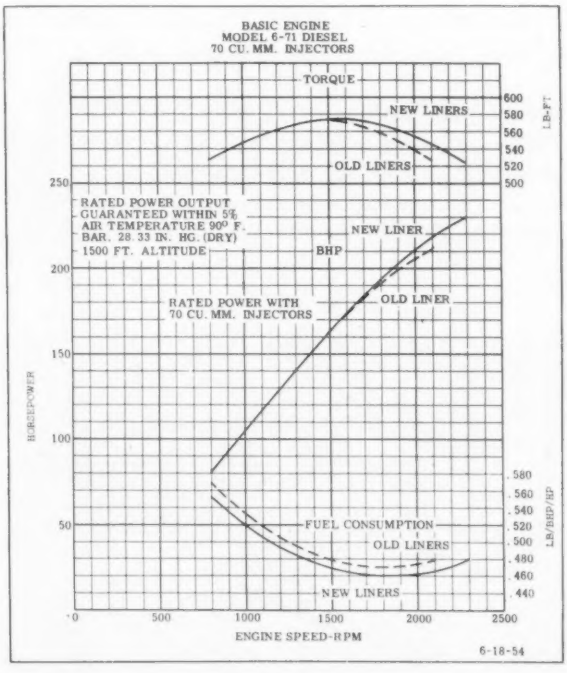
Speaking of Results

Since many of these features are brand new, it's impossible to report on success in achieving longer service life of the parts involved. This will show up later on the maintenance cost sheets; but on past performance, results should be good.

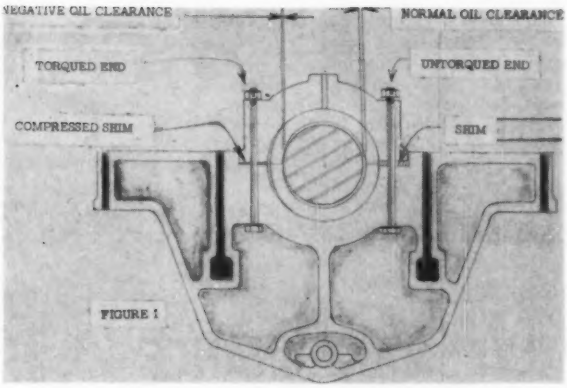
The charts shown tell the story as far as performance gains are concerned. The comparison of fuel consumptions over the years clearly demonstrates one of the benefits derived through refinements—and how important they can be.



Cutaway of new piston pin design shows the new piston pin retainer and modified pin.

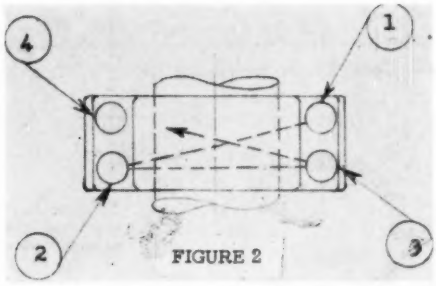


Similar results were obtained in the 6-cyl unit. This shows graphically importance of better engine "breathing".



Note how bearing cap may become tilted if not equally torqued or tightened.

Torque Your Bearings



To make sure the above situation does not exist, use the "X" method of tightening.

OPERATORS should be familiar with the various conditions that may cause bearing failure. Such knowledge will lead to more accurate diagnosis of trouble, and bearing material or lubricating oil is less likely to be blamed indiscriminately for failures.

Most crankshaft bearings have steel or bronze lined shells which are machined to seat closely in the housing of the engine base. The contact between the shell and its seat must be good so as to offer little resistance to the flow of heat from the bearings to the cooler parts of the engine.

How often have factory service men been confronted with this story: "The original bearings in this engine ran for years, but bearings we installed lasted only a short time. What is wrong with them? Why are the service bearings not as good as the original bearings installed in the factory?"

The manufacture of precision bearings for diesel and gas engines is largely confined to companies specializing in this line of work and supplying the various engine manufacturers. In most cases, service bearings are out of the same stockpile as those being installed in new engines on the assembly floor. Therefore the service bearings purchased from the engine manufacturer are as good as the original equipment.

The answer in one word is installation.

There are many factors involved in the installation of service bearings such as cleanliness, proper oil clearance, adequate lubrication of the bearings, method of rolling in, and many others. However, all other factors considered, a matter of prime importance and most generally overlooked by the installing mechanic is the proper method to be employed in tightening and torquing of the cap bolts.

What method is used? It may be that the bolt nuts are run up by hand, a wrench applied, and the handle sledged until the mechanic thinks it is tightened sufficiently. The amount of the blow he gives the wrench handle may depend on his judgment or his energy at that particular time. Or the wrench may be supplemented by a length of pipe, any piece that is handy, and the power supplied by a 135-lb or 250-lb helper, or both. Again judgment, energy, or how well the feet are braced is the stopping point. These hit and miss methods not only tend to destroy the life of the bearing, but may also stress the bolts beyond the safe limits as set up by the designer of the engine.

Also, in these large engines it is much easier and faster to install the bolts on one side and completely torque them up before moving the equipment to the other side of the engine.

When the bolts on one side are completely tightened with the other side free, the cap can tilt slightly and only a few thousandths is necessary to cause the bearing to have negative oil clearance and ride the journal on the side tightened. The clearance is then between the bearing and the housing and the bearing is not properly seated to allow heat dissipation at the parting line area. (See Fig. 1)

Once established, this condition will not change nor will it be corrected when the bolts on the other side are tightened and torqued up. The result can be failure at the parting line area which will be spread to other areas and be transmitted to other bearings by the release of small fatigued particles of bearing material from the failed area becoming suspended in and carried in the oil stream.

To assure proper installation methods and prevent bearing failures, use a torque wrench with settings as specified by the engine manufacturer and use the "X" torque method of tightening the bolts. (Fig. 2)

Tighten bolts 1, 2, 3 and 4 in sequence using a hand wrench. Then torque to foot-pounds as specified with a torque wrench, but reverse the sequence. This method will assure properly torqued bearings with equal clearance between the bearing and journal.

Above all, check the oil clearance. Don't let the newly installed bearing carry the load for the bearings on either side. Proper installation methods take time but they definitely pay off in longer bearing life and less downtime.

the most important line in

VALVE MAINTENANCE

To get the most from that valve job you must restore the original geometry. Here's what to look for and what you must do.

by George L. Erwin, Cedar Rapids Engineering Co.

MISALIGNMENT is a major reason for premature valve failure. Whether you realize it or not, this is a very broad statement because misalignment can be the result of any number of conditions. Distortion of the valve or seat due to thermal effects on them or associated engine components is one example. Improper mechanical relationships introduced during valve work or perhaps through improper cylinder head torquing procedures also result in distortion. And distortion implies misalignment in the sense that some portion of the whole assembly fails to line up properly. Then trouble starts.

It is impossible here to go into all the ramifications of factors affecting valve life. It would mean delving into such subjects as cooling system maintenance and operating conditions as well as practices. Scope of this article will be confined to the mechanical practices and considerations necessary for good valve servicing operations. This is the first, and a very important step, in getting good valve service life.

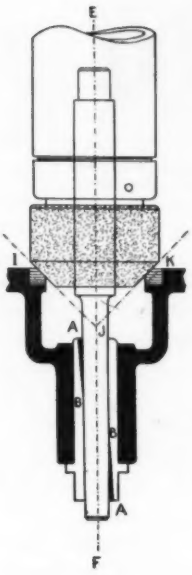
Looking Over the Job

Disassembly of the valves in a cylinder head can be a very important step in the reconditioning job. Here, the alert mechanic can see the condition of parts in their original relationship. He'll know from the records whether it's a routine reservicing job or due to premature failure. In the latter case, careful inspection may give a clue to the reasons behind the trouble.

Start by noting whether conditions found are generalized or local in nature. For example, if all exhaust valves showed signs of burning or cracking, it would indicate a general heat condition. It might be that the engine had been overloaded for long periods or perhaps that timing was late and the valves had been running hot. These are only a few ideas on what might be happening. It would also be well to check that valves of the proper material had been previously installed.

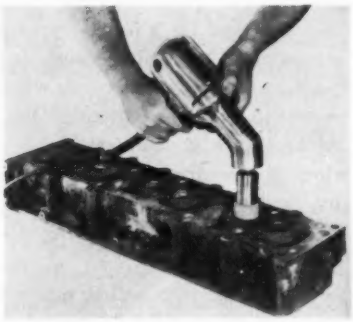
If the condition was confined to one or two valves, some reason for poor heat transfer might be suspected. It could be a guide loose in its bore, sediment or scale blocking heat transfer, or lack of adequate water circulation in the area. In any case, condition of the parts can tell a whole lot if you take the trouble for a thorough examination and use common sense in interpreting the story.

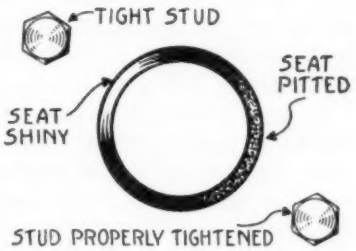
After such an examination, a good practice is to give all the parts a thorough cleaning. Coring plugs can be removed from the head and water jackets cleaned and checked. Solvents, scraping, or perhaps one of the "soft" grit blast machines can be used to remove carbon products. Valve guide bores should be cleaned with one of the special steel spring-bladed scrapers available. With everything good and clean, inspection of the individual



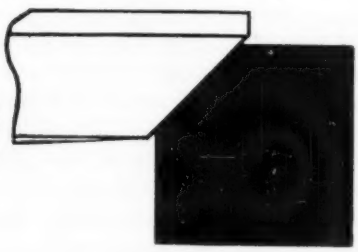
Valve geometry with E-F as all-important centerline. A-B's show wear from earlier misalignment. Special arbor fits unworn guide portion re-establishing centerline for grinding concentric seat angle I-J-K.

Below, seat is ground with a heavy-duty driver turning stone centered on arbor.

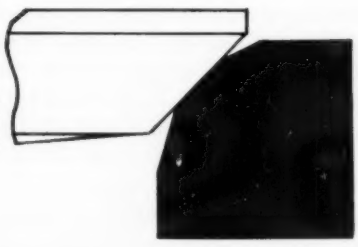




Typical indication of the effect produced by uneven torquing.



Grinding may widen seat too much and/or drop valve too low.



Narrowing stones correct seat width. New insert restores depth.

items can be made to see if they should be reconditioned and continued in service.

That Center Line

In order to locate the three major components—valve, seat, and guide—in their proper relationship a common reference line must be established. In this case, a centerline is used and for reasons to be shown, it is the axis of the valve guide. No matter what the condition of the valve face and seat, for a good job they must be brought back to concentricity with this axis.

This line was adopted for very practical reasons. It is the easiest to establish; the guide bore is most convenient for supporting a centering arbor; and it would be the most difficult to change if correction were required.

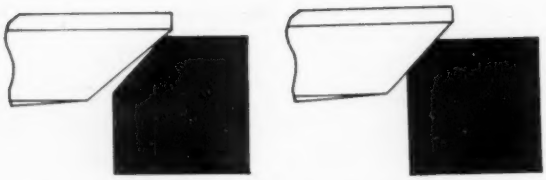
Guides

Since the guide bore establishes our centerline, we want to know its condition. It may be worn beyond maximum limits or it may be worn bell-mouthed due to some condition of misalignment. Of course the condition of the associated valve stem—scuffed or galled—might immediately indicate the advisability of replacing the guide.

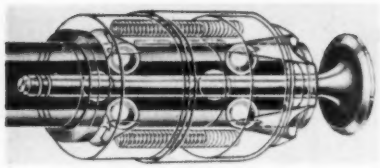
Internal measurements of the guide bore can be made with a ball mike, but unfortunately this does not show its relative straightness. The word "guide" implies that there must be sufficient round and straight area to support and direct valve movement. The most common and practical way to check is to use an arbor. We prefer to use one with a slow constant taper on the portion entering the bore. In this way the almost parallel sides contact the least worn portion of the guide, usually in the central portion, and establish the proper axis even though the ends of the guide may be bell-mouthed.

These arbors are supplied in graduated sets with the largest being near the maximum allowable wear diameter for a given size of valve stem. They can be used like a plug gauge for checking the amount of wear. If excessive, a new guide should be used. When the arbor is in place, its axis is the same as that of the guide and its upper end becomes a pilot for subsequent operations.

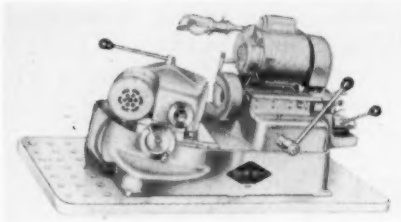
Special dial indicating device checks concentricity of seat.



Exaggerated example of an interferance angle, usually about one-half a degree. Matching angles (right) are often specified and are commonly used with rotators. Follow the specs.



Phantom view of one chuck showing how two sets of balls provide exact stem centering.



Heavy-duty valve refacers of the type shown are needed for the required degree of accuracy.

Reconditioning Seats

Practically all modern engines use valve seat inserts. Their special alloys were selected to withstand today's loads and temperatures, but they eventually need attention. The very nature of seat inserts makes them a ticklish proposition. Most of them are installed with an interference fit although some screw-in type seats are now appearing. When an interference fit is involved, too tight a fit may lead to distortion and perhaps later cracking. If fitted too loosely, they may tend to come out.

In any case, they must be in straight and bottomed in the counterbore so as to give maximum heat transfer. It is easy to see that improper installation may result in a thermal or mechanical distortion condition. A cross check of the seat and the associated valve might point to some irregularity that must be corrected. Uneven wear patterns or alternate shiny and pitted areas will indicate that there has been some distortion. Of course if the seat insert is cracked, it must be replaced.

Check to see if the seat will stand reconditioning. Seat grinding will remove some metal with the result that the seat will widen and run deeper into the head. Narrowing stones will restore the proper seat width at the proper radial distance, but the depth must also be considered.

As the valve drops in further on the seat, spring tension will be reduced as the restrained valve spring length is longer. Also, a problem of geometry arises at the point of contact with the rocker arm. Raising of the rocker arm to accommodate the greater extending length of the valve may produce an undesirable increase in the lateral thrust on the stem. Most engine builders give specifications covering the permissible depth of the valve on its seat. When this is exceeded the seat insert must be replaced.

When satisfied that the insert is ready for seat grinding, it is time for a few more considerations. The proper stones must be available both as to size and type. Composition of seat inserts varies widely and the stone recommendations for the particular seat alloy should be followed to insure a good seat with the proper finish. The stone is now dressed to the proper angle. The wheel truing device is an important piece of equipment because the accuracy of the seat angle will be no better than that of the truing device.

Most of the seats will be either 45 or 30 degrees. There are good reasons for the use of each. Unit pressures are generally higher with the 45-deg seat. However, a greater lift is required to obtain a given flow area than is the case with the 30-deg seat. Also, the 30-deg seat is much less critical to distortion and other forms of misalignment. These are design problems however, and the purpose during servicing is to reproduce the desired angle accurately.

Stones or grinding wheels are mounted on special hubs that are an accurate running fit on the upper end of the arbor. Our units run on ball bearings and have a spring-loaded plunger that holds the wheel out of contact until the grinder wheel is up to the speed required. If a lot of metal is to be removed as in the case of a new seat insert, roughing stones can be used with a fine stone later to get the smooth frosty finish wanted.

Seat width and location are controlled with narrowing stones. Excessive width lowers the unit pressures and makes it more difficult to make a good seal. Too narrow a seat on the other hand, may be inadequate for the loading and may interfere with heat transfer from the valve to the seat. The seat should be located such that when mated with the valve face, there is an overhang both above and below the seat area.

It can be seen that the tooling designed for this work has maintained the integrity of the centerline. When the seat is finished, its concentricity with the axis of the bore can be checked by a dial indicating device built to rotate on the arbor. The feeler rides the seat and the dial indicator shows any runout. Permissible tolerances will vary with valve size and seat angle, but the principle to follow is to keep it to an absolute minimum—not to exceed 0.0015-in.

Reconditioning Valves

Just a look at a valve might be enough to condemn it. Scuffed or badly worn stems and warped, dished, crack-

ed, or badly guttered heads are reasons for discarding. It is important to know and correct the causes if the reconditioning job is to have any chance for success. This emphasizes the necessity for considering all the components as a whole in the earlier stages.

Valve and seat materials play a big part in service life, but for our purposes we must assume that they are adequate for the engine and service at hand. Thermal conditions are a major reason for cracking and breaking, emphasizing the need for proper heat transfer. This means proper stem-to-guide clearance, proper fit of guide in cylinder head counterbore, adequate seating area, and proper seat insert fit in its counterbore. Also, head cooling passages must be in good condition. Note that all of these can be controlled in the valve reconditioning job.

Guttering may start as the result of cracks, distortion, or a deposit condition. High-temperature, high-velocity gases, wire-draw through the minute openings causing severe erosive action. These openings are produced by cracks or improper valve seating due to distortion. The deposit condition, however, is possible even with sound, correctly aligned valves.

In engines using high-additive oils it is not uncommon for hard brittle deposits to form on the valve faces. This ash-like material is largely composed of the inorganic additive materials. As long as it stays in place it makes a hard, smooth seat, but being brittle, chunks may break away leaving openings where wire-drawing of the gases starts.

Inspection of the valves should be complete. It is a lot cheaper to replace them when the engine is down than to take a chance and have one fail in service. Black light inspection is frequently used to locate incipient cracks or flaws not readily apparent. In addition, checks should be made to see that the valve is straight and that there is sufficient metal left on the head for reworking.

There can be no compromise on stem straightness, but slight misalignment due to warping in the neck can sometimes be tolerated if there is sufficient stock in the head to meet the necessary conditions. Runout can be checked by rotating the valve in a vee-block or in the chuck of the valve refacer. Similarly to the case of the valve guide arbor, we feel that the bearing portion of the stem is the only true reference surface from which to work. Our chuck centers the valve by holding it in two sets of balls—three to a set—which grip the portion of the stem operating in the guide.

With the valve centered, the swivel plate which mounts the chuck is set at the desired angle to the grinding wheel. Now we must know what angle to use. An interference angle (about one-half degree difference between face and seat angle) is frequently used. It initially produces a line seal with high unit pressures and is helpful in some cases where deposits are a problem. It has the disadvantage of reducing the heat transfer area which is so important in cooling the valve head. Some engine builders will specify that the angles be matched and this must be done when valve rotators are used. Always follow the manufacturer's specifications.

When the seat has been ground and the required finish obtained, check the thickness of the metal at the edges of the head. In no case should there be a knife edge or very thin section. The thin metal will tend to burn and in any case, will probably lack the hot strength to resist normal impact. It is difficult to specify any definite limits in view of all the different valve sizes and designs; just use common sense and remember the economics previously mentioned.

When finished, check the valve in the guide. The seat should hit in about the center of the valve face. If the job was done right, the seal should be just about perfect. It can be checked by bluing or by the old stunt of drawing lines across the seat with a soft pencil. When the valve is lightly pressed on the seat and given a slight turn, all marks should be smeared.

Spring Tensions

Springs play a vital part in the proper operation of valves. They can make or break your valve job. Low spring tensions can lead to valve flutter, erratic operation, and excessive seat pounding. The last may require a word of explanation.

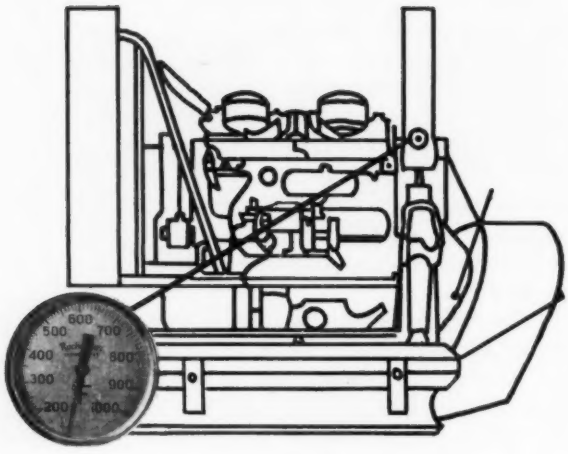
Springs are designed with sufficient tension to keep the actuating mechanism in continual contact with the cams. If this is done, the cam design will ease the valve onto its seat. Acceleration of the valve during opening is very rapid and a weak spring may allow the tappet to ride off the nose of the cam. When this happens the valve gets a free fall. Also, valve lift may be excessive and the valve may hit the piston.

It is a relatively easy job to check spring tension in accordance with the builder's specifications. We make a simple fixture for use with a torque wrench or there are more elaborate ones available. The point is: check the spring tensions.

Conclusion

Many things will happen to valves that you can't control. Don't add to them by slipping up on those that can be avoided. Start with good, modern tooling. There are many good makes available with the capability of doing a good job. Of course we like to think that some of the refinements and ideas mentioned make ours the best. With just about all the equipment however, it only takes a little experience to go through the mechanics of a valve reconditioning operation.

This article has tried to show some of the "plus" factors that come under the heading of background and judgment. You can't build these into tools. Take torquing of the heads. You can do the best job in the world and ruin it by uneven cylinder head torquing. It comes back to that old centerline; you can't get away from it. The use of fast, efficient tooling plus the necessary know-how gives you the best chance to get the most out of your valve servicing jobs.



		BRAKE HORSEPOWER					
RPM	Exh. Temp. °F	6DC 844	6DCS 844	8DC 1125	8DCS 1125	6DC 1879	6DCS 1879
600	500					60	59
	600					80	92
	700					104	125
800	500	50		60		92	107
	700	68	75	90	100	140	162
	800	94		125		170	197
	900		96		128		
900	500					94	111
	700					150	180
	900					199	228
1000	600	96		74		126	137
	800	92	102	121	136	176	220
	1000	117	129	156	172	210	261
1200	700	80		106			
	800		117		156		
	900	113		130			
	1000		150		200		
	1100	116		181			
1400	800	110	125	147	166		
	1000	137	158	183	210		
	1200	152	182	203	242		
1600	800		131		174		
	900	132		176			
	1000		170		226		
	1100	152		203			
	1200		195		260		
	1270	161		209			

Measurement of engine horsepower within accuracy limits acceptable for field work is possible by using the exhaust gas temperature as a reference.

LOAD INDICATION BY THERMOMETER

IT is a well known fact that in diesels there is a correlation between exhaust gas temperature and engine loading. Since there is no restriction in the intake manifold except that offered by the air cleaner and induction system itself—not only minor but relatively constant—the amount of air taken into the cylinder per stroke is substantially constant. Therefore engine speed and power will be determined by the amount of fuel injected.

Total Btu input to the engine is split three ways: the percentage converted to power, that dissipated to the cooling water and by radiation; and, the portion passing out with the exhaust gases. Since engines vary considerably in design and somewhat in efficiency, no arbitrary figure can be set for the percentage of the total Btu input represented by each of the above items.

However if we take a given engine, it is safe to assume that the ratio of the heat loss to the exhaust gas compared to total Btu input will remain constant. This gives us a basis for correlation of exhaust gas temperature to engine loading as reflected in the amount of fuel injected.

Now, if we place a thermometer in the exhaust line where it can measure the temperature of the mass flow of gas, we get a reading that relates to the total fuel input or loading of the engine. The next problem is correlation. The easiest and most accurate way is on a dynamometer.

The engine is run at a given speed and temperature readings are taken at several loads. This is repeated at different speeds covering the engine's range. This data is assembled into a horsepower-temperature correlation chart.

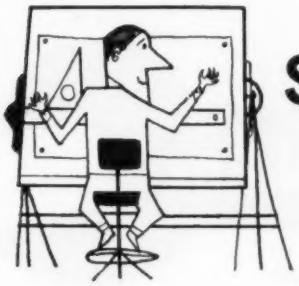
Such a chart is shown. It was worked out by Mr. J. W. Hughes, service manager of Buda Engine and Equipment Co., for six of the larger Buda engines. Data is based on new engines in good adjustment and some allowance must be made for engines not in such good shape.

The pyrometer element used was a Rochester Mfg. Co. Model 1748, 3-in dial-type industrial thermometer with a range of 200°F to 1000°F. Mounted with a standard pipe thread, it was installed in the exhaust line between 4 to 6-in from the exhaust manifold flange. In operation, a glance at the quick-reading dial and a look at the engine tachometer will give the data necessary to read the horsepower output from the chart.

In the event that the dynamometer data is not available for a particular engine, it is still possible to work out a chart of reasonable accuracy. Of course it is necessary to have both speed and temperature indication. The percentage of load with the engine at different speeds can be estimated from the position of the injection racks or governor travel. With some types of equipment it is more difficult than others, but here's a good chance to see how ingenious you are.

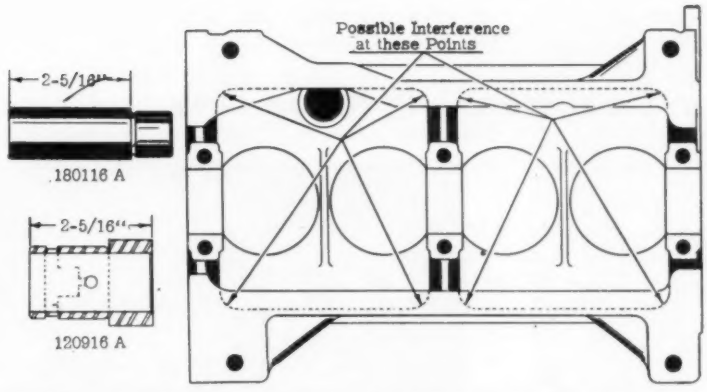
There's nothing new about exhaust temperature measurement to monitor engine operation; pyrometers have been used for years and years on the larger engines. Substantiating the theory of using temperature measurement to check load, a principal use is for checking exhaust gas temperatures of individual cylinders as a basis for injection pump adjustment to balance load among all the cylinders. They are a maintenance tool to check for abnormal cylinder temperatures as well.

What is new is the application of a simple pyrometer to the smaller engines and its adaption to measuring horsepower output. And don't forget, it can also function as a maintenance tool with respect to abnormal temperatures.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you



WAUKESHA—Installing Counterbalanced Crankshafts—Model 180 Diesels . . . .

Recent changes in this engine make a counterbalanced crankshaft available in new production engines. Units now in the field can also be converted to use a counterbalanced shaft at time of overhaul.

When this is done, some interference may be encountered between shaft counterweights and crankcase structure.

Current production engines have been modified to avoid this by changing the stiffening rib radius as shown.

This change may be made in the field if necessary by using a rotary file or similar tool. However, little or no rework may be necessary. This can best be determined by placing the shaft in position and rotating by hand to check clearance.

In addition, the current idler gear shaft, part 180116-A, and the idler gear bushing sleeve, part 120916-A, (both shown), are both 3/32 in shorter. Also, connecting rods, connecting rod bearings, and piston should be replaced by current parts.

CATERPILLAR—Quick Check for Manifold Heater Tube Leaks . . . .

On some Cat engines, exhaust gases from the starting engine are routed through a thin-walled tube inside the diesel engine inlet manifold before being exhausted, thus raising the temperature of air entering the diesel and permitting faster, easier starting.

Any small leak or crack in the inlet manifold connections will let unfiltered air enter the diesel. Since a solid connection cannot be used at both ends of the tube due to expansion and contraction, engines are equipped with either a bellows or a sleeve-type packing at one end.

An easy check for leaks is to run the diesel at low idle speed and with the starting engine stopped, hold a small piece of paper over the starting engine exhaust stack. On a naturally aspirated engine, the paper tends tc be drawn into the stack if a leak is present.

The result will be just the opposite if the engine is equipped with a blower. In either case, the leak should be found and repaired as soon as possible.

EMD—Compression Lead Readings . . . .

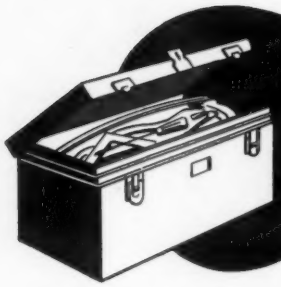
By recording lead reading dimensions at the time power assemblies are installed and at regular intervals thereafter, normal wear rates on various parts (piston carriers, thrust washers, piston pins and bushings, and connecting rod bearings) can be established. Any assemblies which show excessive wear rates can then be investigated and the cause corrected.

EMD now furnishes lead readings taken during initial engine assembly and recommends that readings be taken on all cylinders at approximately 1000-hr intervals. Recommended procedure is as follows.

Locate piston at BDC. Insert a piece of 1/8-in soft lead or solder wire, pre-formed to the shape of the piston head, through the liner ports. Place the center locating pin (formed in wire) in 3/8-in tapped hole in piston head and position the wire parallel to the crankshaft.

Bar the engine over one revolution, remove the wire, and "mike" both ends. Clearance is the average of the two readings. If the difference is excessive, clearance should be rechecked as the wire may have rotated from recommended position.

Piston-to-head clearance limits on a new engine are 0.026-in (min.) and 0.068-in (max.) with average engine readings about 0.040-in to 0.055-in. When a gain of 0.030-in is reached, parts of the assembly should be removed, checked, and worn parts replaced.



Straight from the Tool Box

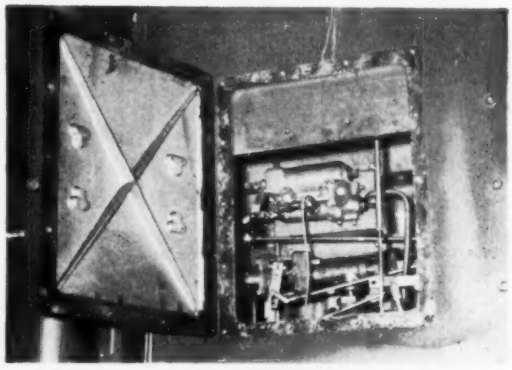
This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Inspection Door Handling Made Easy

L. W. Fitzpatrick, Jefferson City, Missouri—We think that inspections should be made easy. Here in our power plant we have some Superior engines which in common with all other engines require inspection and adjustment. Formerly, every time that we had to get into the rear of the engine to adjust linkages and make other checks it was quite a job. It needed two operators for removing 14 bolts and holding as well as carefully lifting the cast door to the floor.

The problem was overcome by the installation of two heavy hinges and a knurled knob made in our own plant shop. A few spins of the knob and the access plate swings free and out of the way. Regular cap screws fill up the holes in the plate and a stud extending from the engine is used for the knob to make tight again.

We agree; inspection should be made easy. From our observation, more attention could be given in the design stages to some of these servicing problems. One long camshaft cover that we have in mind is a nightmare from the dual viewpoint of sheer number of bolts and the handling problem. However, where sealing is critical there may be little choice—Editor



Above, door swings away easily to give ready access for inspection and adjustment. Door closed at right.

Cleaning Aluminum Pistons

C. A. Bastian, West Allis, Wis.—I enjoy your feature, "Straight from the Tool Box", and find many helpful hints that make my job easier.

Perhaps I can make a suggestion that will help those who are faced with the problem of cleaning sticky carbon and lacquer from large-diameter aluminum pistons without damage to the machined surfaces. After removing the heavier carbon in the ring grooves, simply make a paste of tri-sodium phosphate and water. Rub it on just as you would a scouring powder. If tri-sodium phosphate is not readily available, a common household cleaner will work quite well.

You can clean the lacquer from your liners in the same manner and it is very effective.

That no one likes to clean fouled engine parts will in part account for interest shown in easier methods. Another reason is a growing realization of the extreme importance of internal engine cleanliness. Tri-sodium phosphate is a common ingredient of cleaners found around the shop and generally does a good job. Some new and improved carbon solvents promise even a better job. Be sure to wash your piston thoroughly after any cleaning —Editor

news of our industry

First Gasoline, Now Diesel

A 20-acre lake, over 30-ft deep in pastureland southeast of Clare, Michigan, represents seven years of hydraulic sand and gravel mining on the part of George Hubscher and Son of Mt. Pleasant. Starting out with a small pump and a gasoline engine, the Hubschers turned to diesel power as the project progressed and pumping distances increased. Today, with a second and more powerful diesel, they are moving sand and gravel through 700-ft of discharge pipe at the rate of 100 tons per hr.

Although bigger and more powerful equipment is being used, the operation continues to be a simple 1-man job. Barge equipment includes an 8-in main pump, a 2-piston priming pump, winch, 50-ft ladder, tie lines for maneuvering, and a GM 6-110 diesel. The diesel is V-belted to the main pump and the winch, while power for the priming pump and other accessories is taken from the winch shafting. The diesel installation was made by Earle Equipment Co., Inc., of Detroit, but all other equipment was designed and fabricated by the Hubschers.

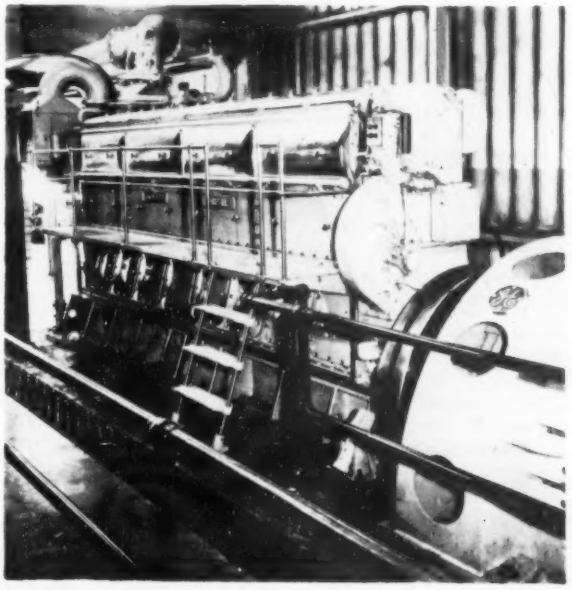
Petoskey Adds 1765 HP

A fourth power unit has been installed in the six-year-old municipal power plant at Petoskey, Michigan. It is a 1765-hp turbocharged Superior Model 65-SX-8 diesel driving a 1250-kw generator. With 25% more power than each of the original three installed in 1948, this unit increases plant capacity from 3000- to 4250 kw. The 8-cyl unit has a bore and stroke of 12¾ in and 15 in respectively, and operates at 600 rpm.

For the year preceding operation of the new unit, the electric power demand of 11,353,000 kwh was one-third over initial requirements of the plant. Net profit on the power system was reportedly more than $100,000 per year. A small part of this power was produced by three hydro stations, with a total capacity of 700 kw, from a limited water supply.

During its first three months of operation the new power unit reportedly operated 351 hr, generated 305,000 kwh, and consumed 21,600 gal of fuel oil, which is equivalent to 14.1 kwh per gal of fuel oil. No lubricating oil was added during this period and plant officials believe that the engine will average 12,000 hp-hr per gal of lube oil.

A refinery at Mt. Pleasant supplies No. 4 Michigan gas oil to the Petoskey plant. This fuel has a calculated rating of 139,773 Btu per gal and a diesel index of 58.3. Specific gravity of the fuel is in the order of 0.8565.



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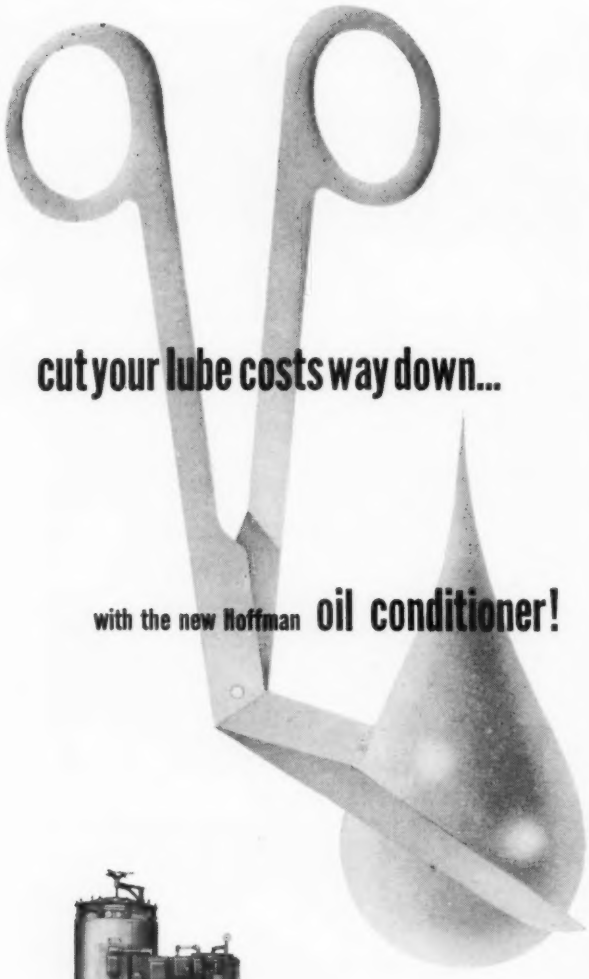

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Let a HOFFMAN Filtration Engineer study your oil conditioning problem and help you make your selection from HOFFMAN's stationary or mobile units, with capacities ranging from 25 to 600 GPH.

For more detailed information and reports from users, write for Bulletin #974, and Case Study #6.

Installation of a Hoffman 300 GPH unit at Wolverine Electric Co-op Inc. Hersey, Mich. resulted in tremendous lube oil savings.

Pump driving diesels at Trans-Arabia Pipe Line Co. require *less* maintenance with Hoffman Oil Conditioners on the job.

Industrial Filtration Division
U. S. HOFFMAN MACHINERY CORPORATION
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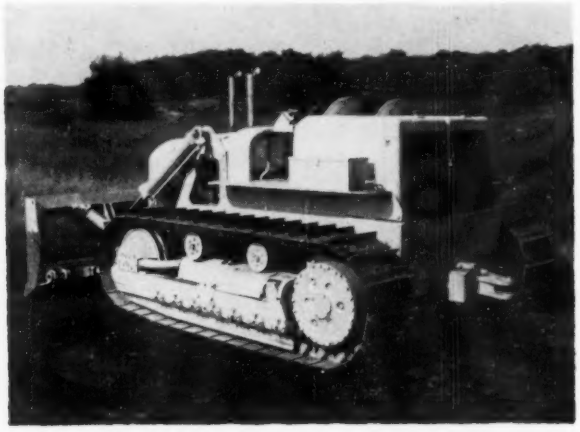
news of our industry

GM Enters Crawler Tractor Field

The Euclid Div. of General Motors Corp. has announced its entry into the track-type tractor market with a new twin-diesel machine of revolutionary design. The experimental 53,000 Model TC-12 went through its paces in a preview demonstration at the General Motors Proving Ground, Milford, Mich., before an audience of distributors from 20 nations. First of a projected line for earthmoving, open pit mining, logging, and industrial applications, the 8-ft high tractor is the vanguard of 20 units to be placed in experimental field service for further testing.

Utilizing twice the horsepower of tractors now in production, the TC-12 is powered by two 190-hp 6-cyl engines, each driving through Allison torque converter and torqmatic transmission, each drive train independently powering one track. Final gear drive is the Euclid



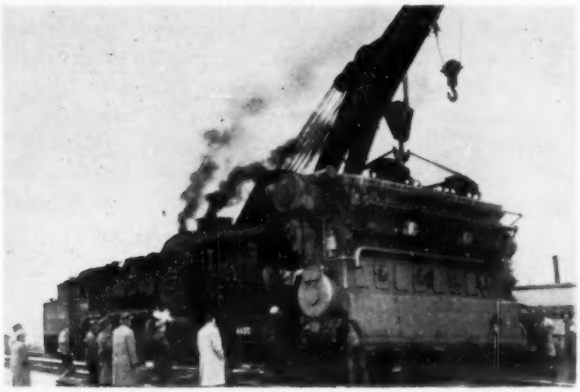
planetary. All shifting is accomplished under full power, with no master clutch and without loss of motion. Top speed is 8 mph.

A flexible steering system increases workability. The tractor can be steered by several methods: by increasing or decreasing speed of one engine for gradual change in direction; by putting one transmission in neutral and applying a track brake; by putting one transmission in forward and the other in reverse for sharp turns under full power.

The machine has "split-half" construction. Two separate drive and track assemblies are free to oscillate on a 7-in transverse shaft, giving flexibility and good traction over rough ground. The tractor may also be separated for shipment where weight and width restrictions require. For applications where oscillation is not wanted, some tractors will be field-tested with rigid mounting on the cross shaft. The tractor can also be dismantled and reassembled with ordinary servicemen's tools. A full complement of attachments is being planned.

The new tractor places Euclid, acquired in 1953, in a market having yearly sales of $400 million, and accounting for more than half of the annual earthmoving equipment market.

news of our industry



3700 Horses on the Hook

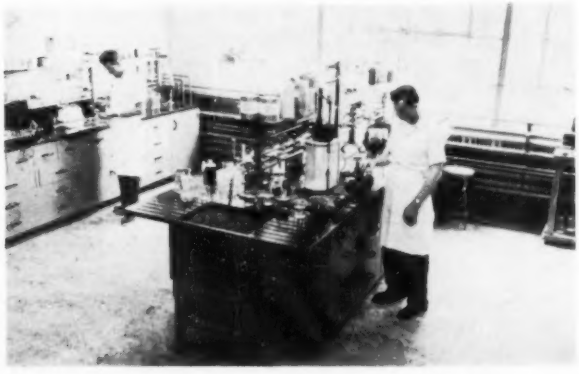
Shown being hoisted is a giant 100-ton LSV 16-cyl Cooper-Bessemer natural gas engine rated at 3700-hp. The huge unit is being delivered to the British Columbia Power Station at Kamloops to generate sorely needed electric power for the Northwest Territory of Canada.

Oakite Enlarges Research Labs

Research and product development in chemical cleaning took another step forward recently when Oakite Products, Inc. threw open the doors to its new and expanded laboratories.

Guests and officials of the company took part in opening ceremonies and then toured the laboratories which cover 30,000 sq ft on a single floor. The laboratories are divided into three major sections: product development, customer service, and engineering. A complete pilot plant is planned for small scale manufacture of detergents and solvents prior to broad field testing.

Each laboratory is set up with modern equipment to aid in the study of various soils. The effect of different solvent detergents on carbonaceous deposits were demonstrated on a diesel piston which had been cut into sections. Each section received a different treatment. In the same solvent laboratory, regulation ASTM equipment was used to determine the boiling ranges of solvents, as were devices for determining flash points. Shown here is part of the transport and petroleum section where chemists are working on body washing compounds for railroad and mobile vehicle application.



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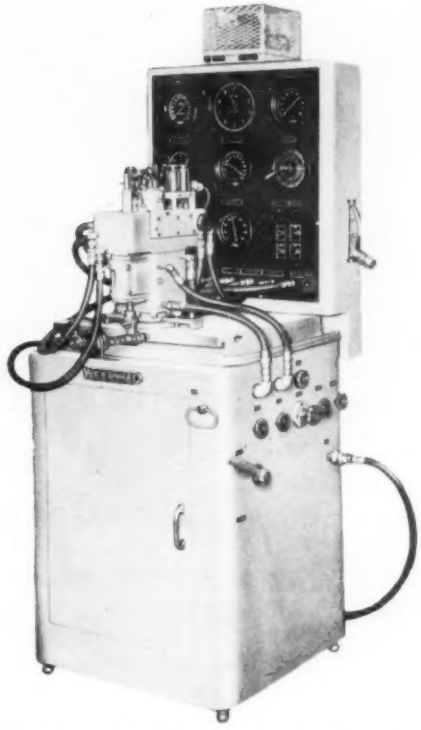

Woodward Air-Operated Diesel Governor Test Stand with Auxiliary Equipment for testing railroad and marine type governors.

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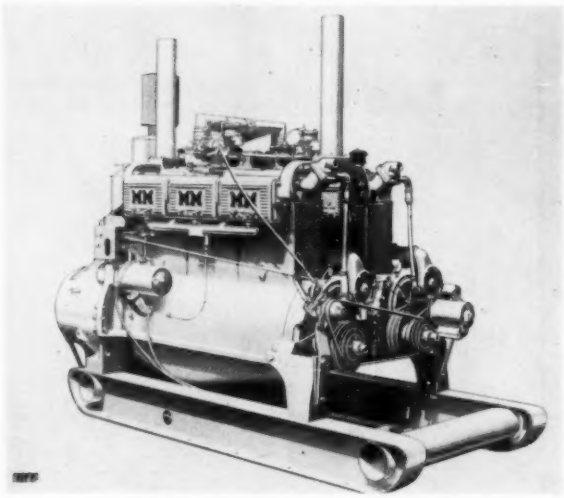
new products



Dual-Engine Power Unit

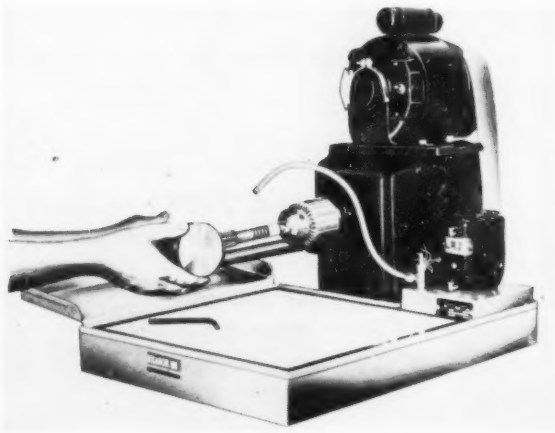
Recently announced by Minneapolis-Moline's manager of industrial sales, Mr. E. A. Henry, was the Model 1600-12A power unit. With horsepower outputs in the range from 252 to 290, the unit operates as a spark-ignition gas engine on either natural or LP gas.

The dual unit consists of two 6-cyl engines of the MM 300-6A class, mounted in parallel and geared to a single power take-off shaft. Total displacement is 1600 cu in. Bore and stroke are 5 5/16 in and 6 in, respectively. Ratings are 290 hp at 1300 rpm and 273 hp at 1200 rpm on LPG, and 262 hp at 1300 rpm and 252 hp at 1200 rpm on natural gas.

Detailed information on the new dual units is available from the company at Box 1050, Minneapolis 1, Minn., or any of the firm's local representatives.

Combination Welder

Amsco Div. of the American Brake Shoe Co. is currently field testing a new, semi-automatic welding machine. Reportedly, it is the first machine to combine the advantages of hand welding and automatic welding. Called the MF welder, it feeds bare wire through a hand-held hopper containing magnetic flux. Flux clings to the wire as it leaves the hopper because of the magnetic field set up by the welding current flowing through the wire. Thus, the electrode wire which is fed continuously from a coil reaches the arc with a flux covering designed to contribute the advantages of a manual flux coating. Descriptive material is available from the company at 230 Park Ave., New York 17, N. Y.



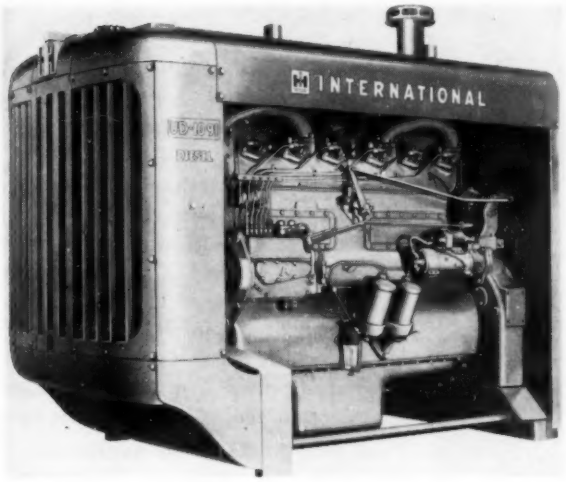
Hone and Reamer Drive

An improved bench-type drive for reamers, hones, lapping bars, drills, countersinks, and many other tools, has been introduced by Reasor Mfg. Co., St. Charles, Ill. The improved model is said to be the only unit of its kind with five control positions—three speed transmissions and two neutral positions—which enable the operator to change from one speed to another or to a neutral position without shutting off the motor. The gear case and mounting base for the unit is an oil reservoir with all operating mechanisms running in a constant oil bath. Power is supplied by a 1/4-hp motor. A coolant pump, powered by a separate electric motor, is available as optional equipment. Circulars covering the hone and reamer drive is available.

I-H Power Unit

Largest power unit in International Harvester's 7-model diesel power unit line, now is being displayed in the showrooms of International industrial power distributors throughout the country. Called the UD-1091, it replaces the UD-24 power unit. As a power unit, the UD-1091 produces 190 intermittent hp or 152 continuous hp at 1400 rpm. For other types of service, it is rated 203 hp for intermittent, and 162.4 hp for continuous, duty.

Net maximum torque of the UD-1091 is 793 lb at 1000 rpm as compared with 775 lb at 800 rpm for the UD-24. The model number of this increased power diesel denotes its cu in piston displacement which is the same as the UD-24. Dimensions of the UD-1091 are also the same as the UD-24.



The UD-1091 reportedly has all the thoroughly proven heavy-duty features of the UD-24, including counterbalanced crankshaft, full-flow lubricating oil filters, International twin plunger injection pump, "Vernatherm" bypass thermostats for quick warm-up and efficient operating temperatures, and the International gasoline conversion starting system.

It is interchangeable with the U-1091 natural gas-burning engine. Both the UD-1091 and the U-1091 can be used with the new Alamo chain drive compound to make a dual-engine assembly.

The entire unit is skid-mounted and available with or without radiators, with air or mechanical throttle and clutch controls, and various gear ratios for power take-off speeds above or below rated engine rpm.

Complete information on the UD-1091 or U-1091 may be obtained from International industrial power distributors or by writing to the Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

BIG NEWS

FOR ALL DIESELS!

FRAM completely removes water from diesel fuel with NEW WATER SEPARATOR & FUEL FILTER

✓100% Water Removal! ✓Traps Dirt and Dust!
✓Cuts injector maintenance costs!
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The new FRAM Water Separator & Fuel Filter is a double-action filter for complete injection system protection—

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Save the cost of replacing expensive injectors! Guard your diesels for longer life . . . less wear . . . fewer repairs—with the new FRAM Water Separator & Fuel Filter! For specific installation information write: FRAM CORPORATION, Providence 16, R. I. Fram Canada Ltd., Stratford, Ont.

IMPORTANT!
Diesels already equipped with FRAM Fuel Filter need only the Water Separator Filter and a new FRAM Coalescer Cartridge for 100% water removal!

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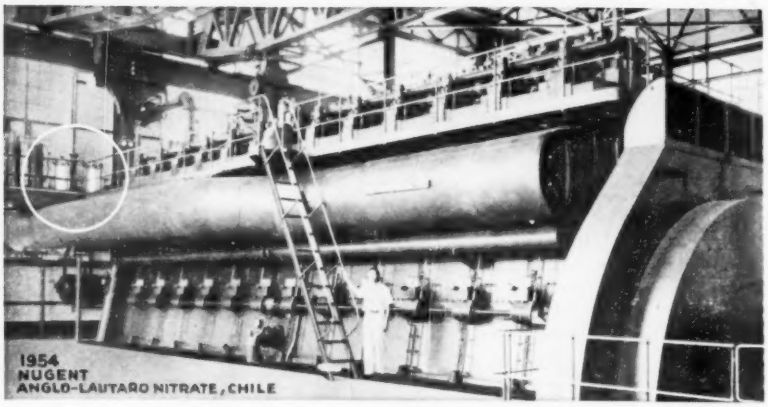
MOST POWERFUL DIESELS



...rely on NUGENT FUEL OIL FILTERS!

● The giant diesel shown above is one of two, 9,600 hp. Nordberg engines installed for the Anglo-Lautaro Nitrate Corporation at their plant in Coya Sur, Chile. The diesels are the most powerful single units ever built in the Western Hemisphere.

Included as original equipment on each of these engines is a Nugent #4L4 twin transfer filter (shown in circle above) for preliminary fuel oil filtering and a Nugent #4L Duplex fuel oil filter (not visible) to provide the final filtering. The Coya Sur installation is another example of Nugent filters being installed as original equipment by a leading diesel manufacturer.

Size for size, Nugent filters of the above type offer greater filtering area than any other filter on the market. In addition, the lubricating oil filters make possible a choice of full flow or by-pass with the same unit. Simple piping makes installation no problem.

No matter what the size of your own diesel power supply—no matter where it is installed, there is a Nugent fuel or lube oil filter to meet your needs. Write for complete information.

◀ Close-up of a Nugent #4L4 filter of the type used for fuel oil transfer on the giant diesels at Coya Sur. Recharges are inexpensive and simple to replace.

▶ Nugent duplex filter of the type used for final fuel oil filtering on the diesels at Coya Sur. By actual test, removes 99.8% of all foreign solids from fuel oil.

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new products

Power Steering for Tractors

Leland T. McGee Mfg. Co., Inc., Compton, Cal., is producing a hydraulic power steering unit which can be installed on any Ford, Ferguson, or Ford-Ferguson tractor without disturbing or discarding any of the regular tractor steering mechanism.

Heart of the system is a radial ball-piston hydraulic pump which contains a counterbalanced crankshaft moving five steel balls in individual cylinders to produce the required oil flow and pressure. The pump uses about 2/3 hp of the tractor hp. Pump relief valve, reservoir, oil filter, and control valve are one self-contained unit. A maximum of 1500-lb power steering pressure can be obtained with finger-tip pressure.

Battery Maintainer

Batteries in storage tend to self-discharge rapidly in warm weather and slowly in cold. A new maintainer has been developed by Fox Products Co., 4720 N. 18 St., Philadelphia, Pa., which automatically adjusts its charge current with the temperature to match the self-discharge current of the battery.

The new maintainer, trade-named Model C-10 Varitemp, is claimed to keep batteries in storage fresh, fully charged, and yet never aged by overcharge. It is capable of maintaining one to five 12-v batteries, one to ten 6-v batteries, or any combination of 30 2-v cells. Input is 110 v, 60 cycles —2.5 amps. Output amperes are 30 to 130 milliamps over a temperature range of zero to 100°F. The self-discharge curve is shown in front of every model. The entire unit weighs 3 lb and can be mounted on shelf or wall. It stands 5¾-in high, 7½-in wide, and 3½-in deep.

new products

Simplified Welding Method

Claimed to be as easy as turning on a light switch is a new method of welding developed by The Lincoln Electric Co., Cleveland 17, Ohio. It employs a special electrode, electrode holder, and small AC welding machine and is said to make it possible for inexperienced persons to work excellent welds.

To make a weld, the tip of the electrode is held against the metals to be joined, at the point where the weld begins. A switch on the holder is pressed to fire the electrode and the electrode, as the tip is held against the metal, automatically makes the weld itself. Locating the beginning of the weld, starting the arc, feeding the electrode, the electrode angle, and the travel speed are controlled automatically by the design of the electrode and holder.

Lincoln calls the new method Self-weld and has introduced a new 100-amp welding machine to be used with it. It may be safely operated on the properly fused electrical circuit of the average home or business establishment, at either 115 or 230 v. The new method can also be used with welding equipment of the types already in operation.

Portable Steam Cleaner

Vapor Heating Corp., 6420 W. Howard St., Chicago 31, Ill., has developed a portable Vapor-Clarkson cleaner, Model 498-G, which jets out 1200 gph of hot water at 240-lb pressure. The 40-hp steam generator in the unit develops 120-lb working pressure in 2 min from cold water, it is stated, and over 1100-lb of steam per hr. Steam is directed through a Sellers injector, with pressure increased by a venturi.

The unit is mounted on a 2-wheel trailer enclosed in a metal cabinet which incorporates fuel tanks for 8 hr of operation and a float control water supply tank. Automatic controls in the generator cause steam-making only when cleaning gun is turned on, the steam generator automatically cycling on and off to hold steam pressure.

Snap-on* VACUUM GRIP PLIERS ...the right pliers for every job!

● Choose from more than 30 Snap-on types and sizes. Each is built to perform its specific gripping, cutting or twisting function *faster, easier, more safely* than any other pliers. Snap-ons are heat-treated from surface to core and the jaws, cutting edges and joints are locally tempered to exact degree of hardness and toughness for greatest durability. Write for catalogs described above. Snap-on branch warehouses in principal industrial centers offer direct service to industry everywhere.

SNAP-ON TOOLS CORPORATION
8064-J 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation

new literature

Plug-Mounted Relays

Detail description of its complete line of industrial relays, plug-mounted for advantage in assembly, inspection, servicing, and maintenance, are available in a series of data sheets from Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, Ill. Dimensional drawings, wiring diagrams, and specifications are provided for Classes A, B, F, S, and Z relays.

Water Testing Equipment

"Testing Equipment for Control Water Analyses" is a 12-page bulletin published by W. H. & L. D. Betz, Gillingham & Worth Sts., Philadelphia 24, Pa. It describes and illustrates the company's complete line of titration stands and test sets for hardness, alkalinity, chloride, sulfite, etc.; conductivity equipment; colorimetric comparators; and photometers.

Utility Air Compressor

Le Roi Co., 1706 S. 68 St., Milwaukee 14, Wis., has issued a 2-page bulletin on its 105-cfm air compressor which has recently been placed back into the company's line.

The unit, specially designed for public utility service, is portable and contains the D226 natural gas engine for power. Photos show the compressor with and without the removable lightweight metal hood sides. Specifications for the compressor and engine and a complete rundown on tool capacities are included.

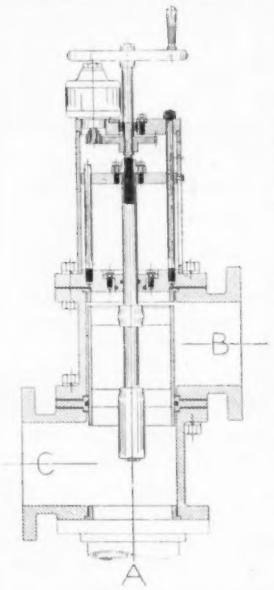
Heavy-Duty Lubricating Oils

Just published by the Internal Combustion Engine Institute, 201 N. Wells St., Chicago 6, Ill., is a 48-page booklet listing the trade names of over 1200 lubricating oils offered by 366 oil companies as meeting requirements for heavy-duty engines.

The oils are divided into three types in the booklet, as represented by the oil suppliers. Type A meets the requirements of U. S. Military Specification MIL-0-2104 and/or the British Defense Specification DEF/-2101, where the diesel engine test uses a fuel of 0.35% minimum sulfur content. Type B is for requirements of U. S. Military Specification MIL-0-2104 where the diesel engine test is modified by using a fuel of 0.95% to 1.05% sulfur content. Type C meets the more severe requirements of a "Superior Lubricant (Series 2)".

The booklet, combining the results of previous efforts of several engine manufacturers to list lubricating oils, should be helpful to an engine owner contemplating the purchase of a particular brand of lubricating oil. He can ascertain just what properties are claimed for that oil by the oil supplier whose trade name is on the oil. A charge of 20c each to cover printing is made for the booklets, plus postage for shipment of more than one copy.

AMOT LARGE MODELS



AMOT model D 3-way thermostatic valves will give excellent automatic temperature control for engine jacket water on header type systems using several engines connected to the same water header.

Features are as follows:

1. 6" to 36" pipe sizes
2. Balanced valve
3. Full modulating control
4. Air motor operated
5. Low pressure drop
6. Adjustable sensitivity
7. Valve position indicator.
8. 2-way model also available

Write for literature and name of your nearest AMOT representative.

AMOT CONTROLS CORP.
RICHMOND 1, CALIF.

New! Engine Work Stand

Bench level working height. 360° rotation of engines up to 70" length accomplished by tilting spindle upwards by means of hydraulic jack.

Adapters available for GM 71 and 110 Engines, all Cummins Engines and other Diesels.
Also for holding transmissions, differentials, etc.

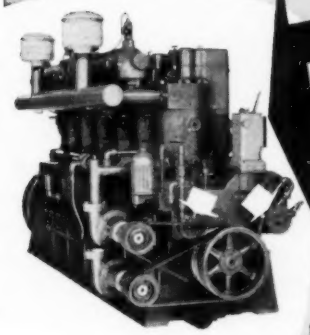
Dimensions:
Overall Height . . 35"
Overall Width . . 42"

Available as mobile stand (as shown) or as stationary unit for floor mounting.

WRITE FOR LEAFLET 683

BACHARACH INDUSTRIAL INSTRUMENT COMPANY

AD-14 7301 PENN AVENUE • PITTSBURGH 8, PA.



For POSITIVE LUBRICATION

It Pays to Specify

TUTHILL PUMPS

For dependable lubrication of diesel engines and power units, Tuthill offers a complete line of positive displacement pumps, designed for lubricating and scavenging. Included are automatic reversing pumps and stripped models for built-in applications.

Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

KIENE®

MODEL K-120

universal peak firing and compression pressure indicator

The Model K-120 is the only maximum pressure indicator that can be used as a compression tester on small, high-speed engines and as a firing pressure indicator on engines having indicator valves. Patented Kiene diaphragm type check valve of stainless steel has no springs or piston, no complicated adjustments, temperature corrections or pressure loss. Bleeder valve permits release of indicator pressure for repeat readings. This instrument gives true pressure readings with an uncompensated gage.

Adaptors for most models U.S.A. engines. Others made to order at reasonable prices.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

new literature

Cooling Tower Information

"Cooling Water for Industry", claimed to be one of the most detailed explanations ever written of cooling tower construction and applications, is available from The Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles 22, Cal.

The 2-color, 36-page publication provides description of induced-draft cooling tower construction and is illustrated with photographs, sketches, cutaway and exploded drawings showing details. Design, methods of water distribution, and all components from basin to fan stack are given in detail.

Wire Thread Inserts

Heli-Coil Corp., Danbury, Conn., announces a streamlined 4-page bulletin on wire thread inserts. All basic information on the inserts and tools are presented in condensed form for time-saving. The bulletin is illustrated and contains five tables of data and installation instructions.

Hand-Torch Brazing Table

The Engineering Div. of Handy & Harman, 82 Fulton St., New York 38, N. Y., is offering a newly developed table as a guide to determining the right amount of silver brazing alloy to use in standard pipe and tubing joints. It refers particularly to that most universal method of joint making, hand-torch brazing with oxygen and bottled gases.

MAK Diesels

To illustrate the versatility of its Design M stationary diesels, MAK, Kiel, Friedrichsort, Germany, has issued a 2-color, 6-page catalog.

The engines are started by compressed air and have force-feed lubrication. They are equipped with Bosch fuel injection pumps and may be obtained with turbo-exhaust blowers. They are illustrated with application photos as power units for electric generation, pump drive, compressor drive, deep well boring, and general industrial use. Cutaway views of engines and a specification table are contained in the literature.

Climate Effects on Operation

The limiting effect of weather upon the operation of 11 major industries is the subject of a series of Air Force studies, entitled "Climatic Criteria Defining Efficiency Limits for Certain Industrial Activities", being made available through the U. S. Dept. of Commerce, Office of Technical Services, Washington 25, D. C.

Based chiefly upon observations and research conducted in the United States and Canada, climatic conditions considered include high and low temperatures, winds, and all forms of moisture. Examined in detail are their effects upon all aspects of production: equipment, communications, operating parts, storage and shipping, fuels and lubricants, plant and structures, supply and delivery, accident rate and time schedules, and the efficiency and safety and output of workmen. Included in the industries surveyed are railroads, industrial establishments, power utilities, petroleum industry, and locomotive and car manufacture.

organizational news

Jo-Line Names Representatives

Jo-Line Tools, Inc., manufacturer of torque limiting wrenches used predominantly by the government for many years, has undertaken the appointment of factory representatives to encourage commercial acceptance of its line of tools.

Appointments have gone to Wolfeboro Equipment Co., Wolfeboro, N. H.; Waldick Engineering Co., Garden City, N. Y.; C. H. Stratton Co., Philadelphia, Pa.; Van F. Belknap Co., Detroit, Mich.; Paul Berry, Inc., Oklahoma City, Okla.; Jas. J. Backer Co., Seattle, Wash.; and L. R. Phillips & Co., Los Angeles, Cal. They will establish and maintain distribution and also assist users with torque control problems and applications.

Permutit Advertising Manager

A. McLean Freeman has been named the new advertising manager of The Permutit Co.

Mr. Freeman has been in charge of the advertising department of the Chemical Div. of the Borden Co. for the last 13 years. He will be joined at his new post by William Renner Feik who has been appointed assistant advertising manager.

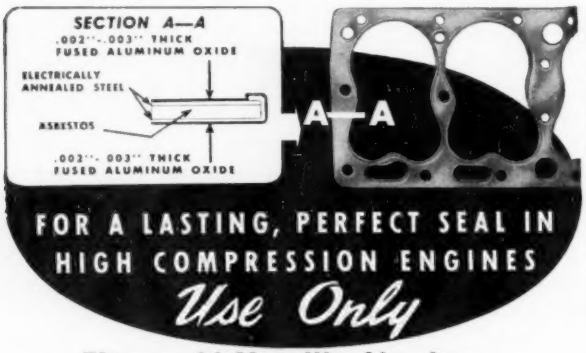
A. M. Freeman

Detroit Diesel Names Manager

Detroit Diesel Engine Div. of General Motors Corp. announces that it has appointed S. G. Morse as manager of its distributor and dealer organization and analysis department. He was formerly factory representative in the Cleveland sales zone. H. E. Smith will replace Mr. Morse.

Oil Well Supply Enlarges

The Oil Well Supply Div. of United States Steel Corp., manufacturers of oilfield drilling machinery and equipment, announces it is planning to increase the size of its facilities at Garland, Texas. The Garland plant, completed in 1950, has served as a central stocking point for Southwestern operations and provided assembly and modification facilities.



FOR A LASTING, PERFECT SEAL IN HIGH COMPRESSION ENGINES *Use Only*

Fitzgerald Metallic Aluminum-Fused-Oxide Steel Asbestos Gaskets

Grease Retainers — Cork Gaskets
FITZ-Rite Treated Fiber Gaskets for oil gasoline and water connections. Complete Sets For Motor Rebuilders.

FITZGERALD *Gaskets*
SINCE 1906
The Fitzgerald Manufacturing Company
TORRINGTON, CONNECTICUT

There's a Fitzgerald Gasket for every Engine

CRANKSHAFTS Rebuilt - Hard chrome surfaced

CAMSHAFTS Reground

Connecting rods rebuilt

Hard Chrome deposited on crankshafts by "Rotary Process" adds new shaft life. Shafts electro heat treated 3 times.
Camshaft lobes reground to original lift.
All parts carefully magnafluxed to detect hidden defects.
Experienced Workmen — Specially Designed Machinery — Careful Inspection, guarantee each job.

Crankshaft Capacity
10" Stroke
24" Swing
96" Length

Camshaft Capacity
100" Length

Write for Information and Prices.

AUTOMOTIVE ENGINE REBUILDERS ASSOCIATION

CLEVELAND HONE & MFG. CO.
8816 HARKNESS RD., CLEVELAND 6, OHIO
Serving the Nation's Largest Fleets

NO MORE CARBON SCRAPING

*Dunk and Drier Basket Included

Nothing Decarbonizes and Cleans CARBURETORS, FUEL PUMPS, PARTS Like..

U.S. Pat. No. 2,318,842

GUNK DUNK BENCH Carburetor and Parts Cleaning Kit. New 6½ gal. size deep "Vapor-catcher" design pail

New-Improved More Potent* GUNK HYDRO-SEAL

*1. Faster . . . Terrific penetration . . . new improved odor.
*2. Quickly digests and removes carbon gum, paint, lead; makes possible accurate visual inspection and fitting of delicate metering mechanisms, jets orifices and diesel nozzles . . . without etching.
3. Lasts more than one year . . . due to water blanket.
4. Works cold . . . Rinses wet or dry.
5. Patented Double Barrel Performance Guaranteed.

A WORD OF CAUTION

If it doesn't bear the Genuine GUNK trademark, it may be a partly diluted imitation—and will not give you the Safety and Advantages of Genuine GUNK and should be flatly refused.

SOLD BY BETTER JOBBERS EVERYWHERE

Write for Name of Nearest Stocking Jobber
—Flatly Refuse Substitute Imitation—

IMMEDIATE DELIVERY
1 PINT OR A TANK CAR

CURRAN CORP.
Mfg. Chemists
LAWRENCE, MASS.

Announcing new line of STICHT VIBRATING REED TACHOMETERS

PORTABLE AND STATIONARY TYPES

MEASURING SPEED BY CONTACT.
IDEAL FOR TOTALLY ENCLOSED ELECTRICAL EQUIPMENT.
• SIMPLE • EFFECTIVE
• DURABLE • SAFE
• IMPOSE NO LOAD
• EASY TO USE
• EASY TO INSTALL

Various models. Ranges as low as 600 RPM, as high as 100,000 RPM.

Write for new Bulletin No. 770-A

HERMAN H. STICHT CO., INC. 27 PARK PLACE, NEW YORK 7, N. Y.
Tachometer Headquarters

organizational news

New Office for Penn Controls

The appointment of David F. Belknap as district manager for its new office in Wichita, Kans. has been announced by Penn Controls, Inc. The new branch is expected to give Penn closer contact with its wholesaler and dealer organizations and to afford better coverage for the automatic control market in this area.

Mr. Belknap became a member of the company in 1953, enrolling in an extensive sales training program. He then worked as a sales engineer at the company's Goshen factory. Prior to joining Penn, he was in the wholesale heating business.

D. F. Belknap

Two Directors for Alco

A new director of industrial engineering and a new director of market research have been announced for American Locomotive Co. Stanley L. Haines will take on the first post and Arthur A. Batts, Jr., the second.

Mr. Haines first joined the company in 1951 as chief industrial engineer of the ordnance division. He helped set up the M47 medium tank production lines and was in full charge of completing Alco's tank contract from April to early August of this year. Prior to that, he was with Sheer Bros., Bendix Aviation Corp., Arrow Safety Device Co., and General Electric Co.

Mr. Batts comes to company from Carborundum Co. where he was director of research for seven years, first joining that company in 1941. In his new position he will conduct marketing surveys, suggest product opportunities, and provide forecasts and various data on business activity. At the same time, Alco announced that the first six months of 1954 show that its diversified production exceeded that for the same 1953 period, which at that time had been just about the volume of its locomotive sales.

Stratoflex Opens New Branch

Stratoflex, Inc. has announced the construction and opening of a factory branch in Los Angeles, Cal., set up to serve the West Coast, Alaska, and Hawaii. Besides office space, primary attention has been given to the establishment of a modern assembly line for aircraft and industrial hose assemblies.

Heading up the new operation is district manager A. B. Quinn. W. L. Jones is in the post of branch manager and C. L. Parker is the plant foreman. Sales engineers are J. J. McGrody and R. G. Wood.

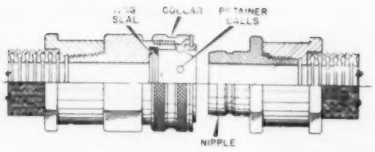
A. B. Quinn

new products

Heavy-Duty Couplings

Titeflex, Inc., 500 Freylinghuysen Ave., Newark 5, N. J., announces that its quick-seal leak-proof coupling is now available in heavy-duty models for high-pressure heavy-flow applications.

The coupling is based on a simple construction said to make the hose line leak-proof the moment the nipple is seated in the coupling body. The



higher the pressure builds up, the tighter the seal. Another feature is full swiveling which prevents hose kinking, permitting rapid hose attachment.

In operation, when the nipple is inserted in the coupling body, the collar is retracted permitting nipple to force the retainer balls outward. Nipple end seats against seal ring. Collar is then released, snapped back by spring, forcing the retainer balls into the nipple's outer groove and coupling and body are locked together. Pressure of fluid inside coupling expands lips of seal ring, making coupling leak-proof at high pressure.

The coupling is made in several types for different methods of hose attachment: female or male pipe thread, expansion ring or barb shank type, which are interchangeable in the same size. Range of sizes includes eight standards from 1/4 to 2 in, and 10 sizes from 2 1/2 to 12 in available on special order.

inside tip.....only HONAN-CRANE DIESEL OIL PURIFIERS give you so many vital engineering features

The Honan-Crane "Multi-Cartridge" Purifier is engineered, inside and out, to provide the high-flow, *thorough* oil purification essential for diesels. Removes *all types* of harmful contamination . . . substantially reduces engine wear and maintenance costs . . . quickly pays for itself in oil savings alone!

Here are a few time-tested Honan-Crane features:

1. Four types of interchangeable cartridges.
2. Clean oil is drawn from top of purifier for maximum cartridge efficiency.
3. Cartridge construction prevents channeling.
4. Electric heater bands maintain correct oil temperature for purification.
5. Oil-and-gas-tight seals and gaskets prevent contamination of clean oil passages.
6. Double-decked cartridges save floor space, permit greater operating efficiency.
7. Positive locks and pressure springs keep cartridges securely in place, prevent by-passing.
8. Purifier is fully equipped with automatic controls and safety features.

INTERCHANGEABLE CARTRIDGES FOR HONAN-CRANE PURIFIER

TYPE "MC"—Cotton bag packed with Cranite (fuller's earth). Removes products of oxidation . . . acids, gums, etc. Provides refinery-type purification.

TYPE "MF"—Perforated metal basket packed with Palconia (cellulose fiber). Recommended for additive oils for complete removal of dirt, scale and other solids.

TYPE "S"—Contains Palconia (cellulose fiber). Performs same as Type "MF." Fiber center-tube simplifies disposal of spent cartridge by burning.

TYPE "E"—Similar to Type "S" except that filtering material is cotton waste and excelsior. Type "E" is recommended when water is encountered in the oil.

Honan-Crane Fuel and Lube Oil Purifiers are available for any size or make of Diesel Engine. For detailed information, write Honan-Crane giving make, model and H.P. of your diesel. Describe any unusual aspects of your particular oil purification problem.

HONAN-CRANE CORPORATION
305 Wabash Avenue • Lebanon, Indiana
A Subsidiary of
HOUDAILLE-HERSHEY CORP.

Rust Converter

Municipal Steel Corp., 1225 Broadway, New York 1, N. Y., is distributing FerRoSeal, a liquid which is said to chemically convert rust into a protective iron phosphate coating. This product, new to America, is also said to be the only cold phosphating treatment for rusted iron and steel. It is a patented process developed in England.

It is claimed that this process eliminates need for sand or shot blasting, or acid pickling, and requires only wire brushing of scale and loose rust. No subsequent water rinsing is necessary. The distributor states that the material is not an additive. It works in harmony with coal tar products, zinc base materials, silicons, vinyls, and other coatings, as well as paint. One gallon is said to cover a 1000- to 1500-sq ft area depending upon the thickness of the rust layer.

Truck Tank Discharge Valve

Chem-Valve is the designation of a new stainless steel discharge valve for use on all types of truck tanks. It is said to eliminate such problems as clogged outlets caused by congealing liquids and the heating of these outlets before unloading.

The valve is sold as a complete assembly or in parts. These consist of mounting ring, bolts, extension rod, universal couplings, packing gland, and hand wheel, available from Chem-Valve Corp., Kenvil, N. J.

new products

Centrifugal Compressor

Worthington Corp., Harrison, N. J., recently demonstrated its first single stage centrifugal pipeline compressor built for the Northern Natural Gas Co. for operation at its Macksville, Kans. booster station. Designed for gas transmission pipeline service, machines of this type are available in several sizes having either 20-, 24-, or 30-in inlet and discharge flanges.

The first-stage unit in a 4-unit station, the displayed compressor will be driven by a 5700-hp 2-shaft gas turbine. Designed for a rated flow of 748 million cu ft per day with a suction pressure of 434 psi, its discharge pressure is about 500 psi and its nominal operating speed of 4750 rpm requires about 5200 hp.

To minimize shaft centerline distortion, main casing and support design have been achieved. The casing, allows a maximum working pressure of 1000 psi so that various impellers may be used as flow conditions of the pipeline may require on future expansions. The shaft barrel supporting the rotor is carried on the casing cover and is easily removed through the front of the machine with assembly tools provided by the company.

As an additional guard against accidental seal oil leakage into the gas stream, the casing is spherical to provide a cavity behind the impeller. An integral lubrication and seal oil system is provided, which is independent of the driver-lubrication system. A single pump used on the compressor for both seal oil and bearing lubrication is mechanically driven from the shaft and supplies seal oil at a somewhat higher pressure than the gas pressure at the seal.

In case of pump failure, an elevated tank stores emergency supply of oil at enough pressure for the seal and to lubricate the bearings. Oil supply from the pump is divided by a control valve operated by a level signal from the tank. The oil stream enters the barrel at intermediate pressure and full delivery passes through the thrust bearing and the inboard journal bearing. Level and temperature alarm devices are provided and most of the lube system equipment is housed in a separate console.

Multi-Purpose Fuel Additive

The Shaler Co., Waupun, Wis., states that its new multi-purpose fuel oil additive is definitely not a lubricant. It is designed to serve as a detergent, dispersant, and solvent to aid in preventing and eliminating sludge formations, gum and varnish in the fuel supply.

The additive is said to readily mix with the fuel to reduce possibility of stratification and to aid in reducing maintenance of strainers and filters. It is also said to be of help in keeping all moving parts clean, including pump assemblies, metering chambers, injectors, guide pins, valves and tips and to aid in providing the best possible atomization. Container sizes range from 1-gal cans to 50-gal drums.

Here's why YOU SHOULD
CONTROL CORROSION
WITH Chromates

no other chemical is as powerful an inhibitor against the corrosive action of water on iron or steel.

no other chemical is as effective against bimetallic corrosion.

no other chemical provides as satisfactory protection in high-chloride water or brines.

no other chemical completely nullifies the corrosive effect of aeration.

Mutual Bichromates and Chromates are being used as corrosion inhibitors in an ever-increasing number of applications. In most instances the amount of chromate is so small and the cost so low when compared to the value of the equipment protected that chromate is preferred over other inhibitors.

Typical uses for Mutual Chromate corrosion inhibitors are in cooling towers, heat exchangers, condensers, engine and compressor jackets, boilers and idle equipment, hydraulic systems and refrigerating brines. Write to our Research and Development Division for recommendations for using Chromates in your equipment or process.

SINCE 1845

MUTUAL CHEMICAL COMPANY OF AMERICA

99 PARK AVENUE • NEW YORK 16, N. Y.

new products

Clutch-Coupling Unit

Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich., has introduced a clutch-coupling unit designed for applications where over-running features are required in conjunction with a flexible coupling, generally in dual-drive and alternate power usage.

The manufacturer indicates that it is necessary to have two different types of clutch-coupling units to compensate for the large range of operating conditions encountered. Within the same space limitations, Formsprag makes available two types of construction. One is for low speed over-running applications; the other for high speed over-running conditions.

Oscillating Valve Grinder

Equitable Equipment Co., Inc., 410 Camp St., New Orleans 12, La., is marketing a valve grinder that is readily adaptable to field repair of valves without need of removing valves from the line. It is designed for the grinding of plug tappet valves and also poppet valves. For field use, the tool is hand-operated while a stand is normally used when making bench repairs.

The pneumatic oscillating grinder is composed of two single acting opposed pistons connected by a rack which moves horizontally. The rack engages the pinion on the spindle, thus imparting oscillating motion to the spindle. This motion is said to prevent cutting of ring grooves and to produce an accurately ground and smooth valve seat.

Weight of the unit is 24 lb. Operating pressure is from 30 to 120 psi. Angle of oscillation is 240 deg regardless of rate of oscillation which is adjustable by amount of air admitted.

Vibrating Reed Tachometers

Herman H. Sticht Co., Inc., 27 Park Pl., New York, N. Y., announces a new line of vibrating reed tachometers.

The instruments operate on the principle of resonance to afford an accurate measure of rotational speeds of enclosed equipment. They are said to require no contact with rotating shafts or moving machine parts. Each unit consists of a set of carefully calibrated steel reeds which are tuned to selected frequencies of vibrations and then placed into the unit housing, its scale reading in rpm.

Instruments are available with single, double, and triple rows of reeds in ranges between 900 and 100,000 rpm. Portable types (held against the equipment) come in standard sizes and dwarf size. Stationary types (permanently mounted on the housing) are supplied in round and rectangular cases.

here's why your engine needs this PENN SAFETY CONTROL

Overheated cooling water or lube oil pressure failure can develop anytime in any engine. When it does... the Penn Safety Control goes into action. Automatically it sounds an alarm, flashes a warning light or stops engine operation... whichever you prefer. Then, the fault can be investigated and corrected *before serious damage* occurs! Learn more about this low-cost protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ont.

PENN AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

new products

Drill Press Vise

Dril-Lox, a work-holding vise for drill presses, said to have major time-saving and safety advantages, has been added to the line of Price & Rutzebeck, 22150 Meekland Ave., Hayward 169, Cal. It is also reported to give even the most simple type of press all the flexibility of a radial drill.

Instead of the conventional vise-locking-the-work principle, the drill torque on the work piece automatically locks the vise, and work pieces since they are free-floating find their own center in the vise. Two thumb nuts fasten the device to the drill table. Work can then be inserted between the rails of the device or the vise can be slid off the table in an instant. Four sizes are offered. Literature detailing operating illustrations is offered.

Retaining Ring

A radially-applied retaining ring which can be locked positively in its groove and used as a shoulder against rotating parts, replacing nuts, bolts, springs, and other accessory fastening devices, has been placed on the market by Waldes Kohinoor, Inc., 41-16 Austel Pl., Long Island City, N. Y.

Called Series 5139, the fastener is made of spring steel in a bowed horseshoe-shape. When fastened to a shaft, it is locked in its groove by two prongs extending from the inner circumference of the open end. It is manufactured in sizes to accommodate shafts ranging from ⅛- to ½-in diam, with larger sizes available for special applications.

Surface Roughness Scales

New cylindrical surface roughness scales, designed as a standard of comparison by sight and touch for internal and external curved surfaces, have been developed by General Electric Co.'s instrument department, Schenectady 5, N. Y. They consist of two scales each per set, 6-in wide and 2-in long. They are said to be ideal for determining roughness produced by grinding, lapping, honing, superfinishing, turning, boring, etc.

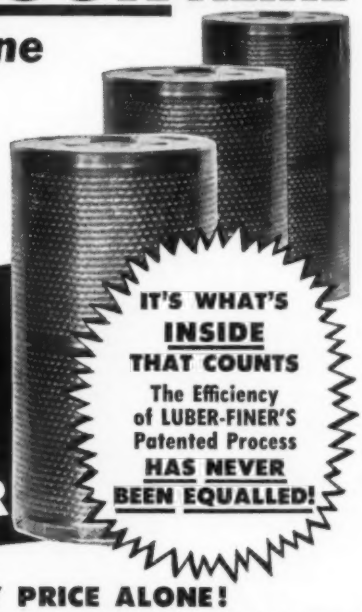
Scale No. 1 is capable of determining roughness of 10 specific surfaces, such as produced by grinding or lapping, in the 4-, 8-, 16-, 32-, and 63-micro inch categories. Surfaces on this are both external and internal. Scale No. 2 is for roughness produced by lathe and machine operations in the 16-, 32-, 63-, and 250-micro inch values represented by turned as well as bored surfaces.

Roughness on both scales are specified by numbers stamped on the sides of each unit and represent the arithmetic average deviation from the mean surface in micro inches. The scales provide a standard objective reference by which roughness and appearance of numerous finishes may be designated. In addition, they may be utilized for determining processing procedure and in selection of tools and equipment necessary to produce finishes required by specifications.

FILTERS MAY LOOK ALIKE

But ONLY Genuine

Luber-finer PACKS



Give the Results Enjoyed by MILLIONS OF SATISFIED USERS THE WORLD OVER

IT'S WHAT'S INSIDE THAT COUNTS

The Efficiency of LUBER-FINER'S Patented Process HAS NEVER BEEN EQUALLED!

DON'T BE MISLED BY PRICE ALONE!

There is NO substitute for DIESELPAK'S Patented Filtering Process for H. D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

✓ PROTECTS ENGINE

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc. from oil, and is engineered to keep the filtering media and the removed contaminants from migrating back into engine. The DIESELPAK assures continuous protection that reduces engine wear and maintenance costs far beyond that possible with other types of filter elements.

✓ EXTENDS PERIODS BETWEEN DRAINS

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

✓ TAKES LESS OIL

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

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Since Luber-finer was first introduced to the public in 1936, it has gained world-wide acceptance by millions of satisfied users everywhere. Luber-finers are approved by major oil companies and petroleum engineers. Luber-finers are standard or optional equipment on America's foremost stationary engines, diesel trucks, tractors and earth-moving machinery.

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2. *DIESELPAK*—First made available in 1941, the DIESELPAK was primarily designed for use with H. D. detergent compounded oils under the direction of Dr. Ulric B. Bray, B.S., Ph.D., F.A.I.C., internationally known Petroleum Chemist. The DIESELPAK has also achieved outstanding results when used with fuel oils and straight mineral oils.

GET THE FACTS FREE!

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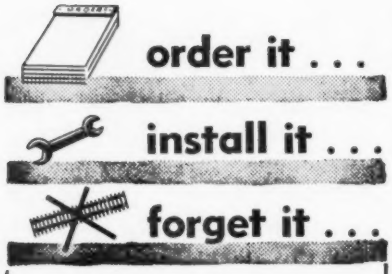

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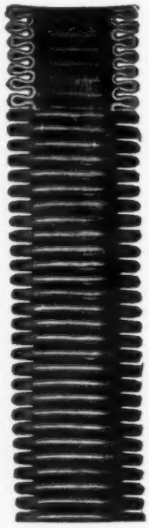

Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

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new products

Spark-Proof Diesel Truck

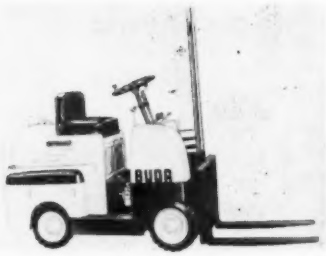
The Buda Co., Div., of Allis-Chalmers Mfg. Co., Harvey, Ill., has developed a series of special spark-proof diesel-powered fork lift trucks in 3000- and 4000-lb capacities, suitable for use in areas where ordinary non-protected trucks are prohibited. Developments are also underway to include all Buda models from 3000- through 7000-lb capacity in this particular line.

Use of the diesel engine in the trucks completely eliminates hazards due to possible electrical sparks. Combustion chamber ignition results from engine compression only, and no electrical instruments are used in the new trucks.

The engine is started by a hydraulic motor which is operated by the driver from his position on the truck by simply releasing a mechanical lever. Energy is taken from a hydraulic accumulator. The accumulator, mounted in an accessible location, is initially filled by a manually operated pump located adjacent to the driver's seat. After the accumulator has been filled, constant pressure is maintained by the truck's standard hydraulic pump.

Electrical dash instruments have been replaced by mechanical or pressure-operated instruments. Because a battery is not required, the electric generator has been eliminated. A water-cooled exhaust manifold further reduces the diesel engine's inherent low surface temperature. Water coolant for this manifold is part of the standard engine cooling system. A water muffler also eliminates possibility of sparks passing out of the engine exhaust pipe, with water for this stored in a special reservoir.

The new trucks are available with static conductive tires and they may also be provided with a protective wood bumper for three sides of the body to prevent sparks resulting from accidental striking of spark-producing surfaces. Special non-sparking metal forks are also available.



Tiny Balloons Stop Oil Loss

Microscopic balloons made of bakelite phenolic resin said to halt crude oil evaporation losses by forming a floating roof on the oil in storage tanks have been placed on the market by the Bakelite Co., Div. of Union Carbide and Carbon Corp. Reduction of 80 to 90 per cent evaporation loss is reported.

The balloons range from .0002- to .0036-in in diam and were tradenamed Microballoons by Standard Oil Co. of Ohio who developed them. They are filled with inert nitrogen gas sealed in by thin walls of the resin and have a bulk density of about 8.7 lb per cu ft. In experiments, the balloons have floated on the surface of crude oil for more than two years without sign of deterioration.

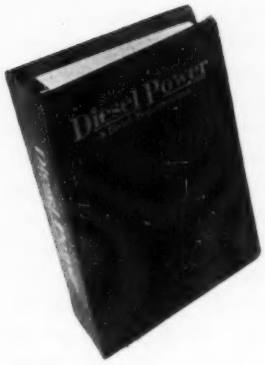
Valve Seat Grinder

Cedar Rapids Engineering Co., 902 17th St., N. E., Cedar Rapids, Iowa, has introduced Model SSG (Super Seat Grinder) as a heavy-duty addition to its Kwik-Way line of engine reconditioning equipment. The SSG features a more powerful universal motor and integral angle drive.

The 1/3-hp motor works through heavy-duty spiral bevel gears with sufficient power to grind diameters as large as 4 in. The company emphasizes the 53-deg angle drive, pointing out that the angle permits work on in-the-chassis jobs or other tight spots.

The new model is made for use with the company's Kwik-Way tapered self-centering arbor and hex seat grinders. According to the company, the arbor is a strong feature of the unit, it centers itself in the smallest or unworn portion of the valve stem guide and makes misalignment impossible.

Diesel Power Binder



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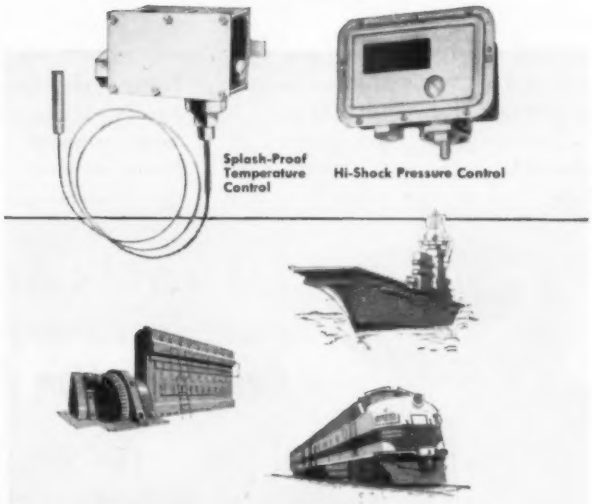

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news of our industry

Cat Modifies D1300

Changes in the design of its D1300 diesel engine, resulting in increased outputs, have been announced by Caterpillar Tractor Co. Increases of from 1000 to 1225 rpm and from 120 to 150 hp have resulted for the D1300 marine engine. The new D13000 diesel-electric set now operates at 1200 rpm and at an increase in capacity from 80 to 100 kw.

Positive action valve rotators, replaceable valve seat inserts, and larger and stronger valves have been made standard on the breathing system. Vibration-free operation is made possible by use of a metal-enclosed vibration damper fastened directly to the front of the crankshaft which is optional where engine speed is kept below 1000 rpm.

Improved high lift cam profiles are said to give better valve seating and increased breathing ability. A new oilbath air cleaner and larger intake and exhaust manifold help handle additional air required by the more powerful engine, helping to lower exhaust temperatures and create reserve power.

A larger water pump of increased capacity has been added, with a new face-type seal said to require no adjustment by the operator to compensate for wear. Larger water lines and water manifold are supplements for improved cooling of engine. Now only two operating adjustments are needed—fan belt adjustment and infrequent valve clearance setting.

Oil-cooled pistons, of high strength, lightweight aluminum alloy with stainless steel heat plugs in high temperature zone, and cast-in iron bands for the top ring groove, are also included. The oil pump has throttling valve pressure controls. One of these valves controls the intake of oil from sump, the other acts as a safety mechanism. Oil pickups are at front and rear of engine.

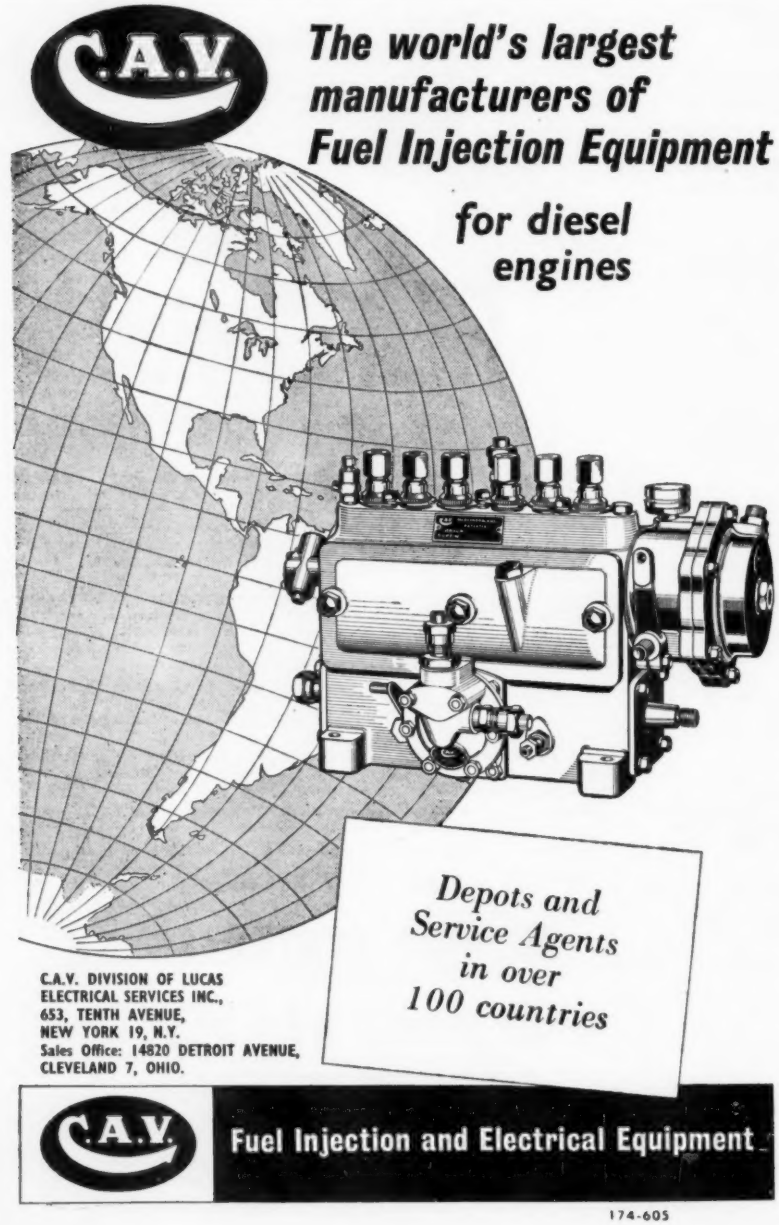
CNR Orders 127 Diesels

As part of its 5-year dieselization program, Canadian National Railways has placed its largest locomotive order to date for 127 units to be built by Canadian and U. S. manufacturers. Deliveries are expected to be completed in May, 1955. Over 300 diesels are now operating on the government-owned track.

General Motors Diesel Ltd. received the largest slice of the order, contracts for 53 units. These include 27 road switchers and 13 each of the "A" and "B" engines. An order for 23 1600-hp road switchers went to Montreal Locomotive Works Ltd. Canadian Locomotive Co. will build 18 road switchers and six each of the "A" and "B" types.

For Grand Trunk Western Railroad, a U. S. subsidiary of CNR, an order has been given to the Electro-Motive Div. of General Motors Corp. for 15 freight road switchers and two passenger road switchers. American Locomotive Co. will build four 1600-hp road switchers for Central Vermont, another U. S. subsidiary.

Earlier this year a House of Commons committee had authorized CNR rolling stock expenditures of $147 million, including 225 diesel locomotives. It is understood that more orders may be placed in the current fiscal year.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news of our industry

GM Hot Box Study

To combat an old mechanical headache of railroads, journal bearing failures or "hot boxes", General Motors research laboratories in cooperation with the Allison Div. tackled the problem from two angles: lubrication and design. The project began two years ago when Arthur F. Underwood, head of the mechanical development department, was asked by a railroad president to find out what GM's bearings experts could offer them.

A hot box occurs when a journal bearing on the wheel of a car gets too hot, usually from improper lubrication. In extreme cases, the hot bronze bearing cuts into the car's steel axle or journal and breaks it.

Mr. Underwood explained that members of his staff first tested samples of bearing oils. Early diagnosis was that the oil being used would become thin under ordinary operating conditions, resulting in metal-to-metal contact between bearing and axle. Although some railways were using an "oiliness additive" in their lubricants, he said, tests revealed that it had little effect on cutting down hot boxes in service. The suggestion was to use a different additive compatible with the metals in a railroad journal bearing—bronze with an outer layer of lead babbit.

Equipment was set up for full-scale tests under a selected additive. Results indicated that under conditions selected to test scoring ability of bearings, the bearings could not be scored. Without the additive, the bearings would fail.

At the same time, the mechanical development staff began examining the possibility of substituting an aluminum bearing for the standard bronze model used. Three types were developed. The new bearings weigh about 8 lb which is approximately one-third the weight of the bronze bearing. Further testing of the new bearings has been undertaken by Allison Div.

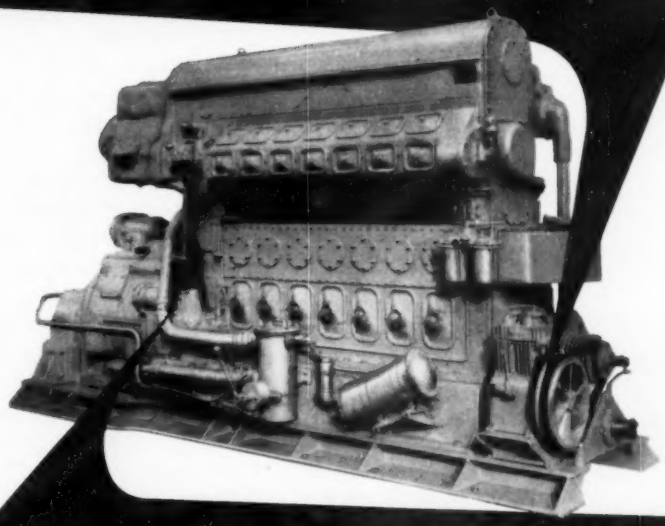
Mr. Underwood pointed out two advantages. The aluminum type would be cheaper than bronze on a per-pound basis. A hot bronze bearing produces "copper penetration" in a steel axle or journal, reducing axle strength and leading to break-off. An aluminum bearing, even when running hot, will not produce this effect.

The new data have been turned over to the Assn. of American Railroads for whatever use it wishes to make of them. One railroad company is continuing investigation of the work on lubricants.

Burma Orders German Diesels

M.A.N. (Maschinenfabrik Augsburg-Nurnberg AG), Augsburg, Germany, announces it has received an order for 57 diesel-electric generating groups ranging from 70 to 775 hp from the government of Burma. Until now the Burmese government has bought British-built engines exclusively. In line with the order, Burmese personnel have been sent to the M.A.N. plant on a 1½-yr training course in order to service the units after their installation.

Quincy FOR DEPENDABLE STARTING



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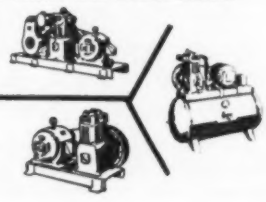

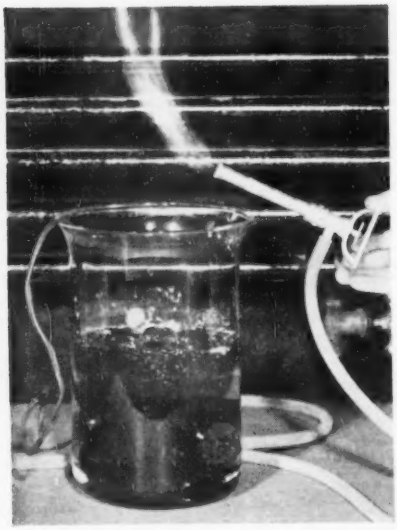

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news of our industry

Discuss Diesel at AIEE Session

The diesel-electric locomotive, major prime mover on the nation's railroads, was taken apart and critically examined at the fall general meeting of the American Institute of Electrical Engineers during a session on land transportation.

Mr. W. E. Kelly, Pennsylvania Railroad, pointed out the need for additional methods of testing diesel insulation and further development of present methods.

Mr. R. I. Fort, Illinois Central Railroad, discussed the problem of wheel slippage which is harmful to rails and may do extensive damage to diesel electrical equipment. "There is no simple solution to the problem but railroads are joined with the manufacturers in refining and perfecting wheel-slip control", he observed.

Mr. L. Elton Logg, Chicago & Northwestern Railroad, stated that there is no question regarding the soundness of engineering employed during the design and construction of diesel-electric locomotives, but many of the refinements follow as a result of the experience gained by the various railroads that must operate them. Improvements have included elimination of nuisance grounds, simpler tests of insulation, efforts to prevent costly flashovers, and improved interlocks and fuses, he said.

Mr. G. T. Bevan, International General Electric Co., indicated that in early days diesel-electric locomotive gears were selected that would be best suited for a particular service. Now, he said, the trend is to select gears that permit use of the same diesel for passenger and freight service and in many instances, switching service also.

Hill Sells Old Diesel Line

Hill Diesel Engine Corp. announces that it has disposed of all service parts, patterns, and blueprints for its discontinued diesel models to the WHW Machine & Tool Co., Lansing, Mich. This was done in order to devote full time to present models of Hill diesels.

All records and parts sold were on the following models: Types B, PB, PBM, A, PA, PAM, C, PC, PCM, and V-8. Servicing of all parts for the above models, which where discontinued about 12 years ago, will now be handled directly by WHW.

Power Show Reacts to New Era

With a salute to the atomic age, the 21st National Exposition of Power and Mechanical Engineering will parade a greater variety of new developments than ever, from the first marketable reactor to the latest in brains for the robotized manufacturing plant. Under the auspices of the American Society of Mechanical Engineers, the exposition will be held at Philadelphia's Commercial Museum this year, dates December 2 to 7, instead of New York where its annual meeting takes place concurrently.

For the first time, a unitized design for research reactors will be shown by the American Machine and Foundry Co. which is engaged in a standardization program. Some of the units are already in the prototype stage. Control systems presently being developed will include shim and regulating rod drive mechanisms and associated mechanical gear, rod guides, lattice assemblies, bridge mountings for control equipment, irradiation devices, and handling tools.

Other exhibits will reveal advances in automation, ranging from automatic regulation of a single mechanical operation to the masterminding of an entire power generating station. Television models for industrial application will also be exhibited, which make possible observation of events once beyond range of human vision, especially those occurring in remote or hazardous locations. One exhibitor will demonstrate a 5-in monitor which shows how a power plant supervisor can view high temperature operations.

The Instrument Society of America will hold an all-day symposium on December 2 at which technical papers will be presented. On that day, too, an inspection trip to the show will be staged by the ASME via the Fairless Works of United States Steel.

news of our industry

Diesels Pursue Railroad Gains

Diesels have steadily continued to supplant steam on Class I railroads, according to tabulations recently released by the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission. Latest published figures reveal that for the first four months of 1954, diesel-electric locomotives performed five-sixths of the gross-ton miles of freight service, close to six-sevenths of the car-miles of passenger services, and eight-ninths of locomotive hours of yard switching service.

Compared with the same period of 1953, diesel gains established were 10 percentage point in freights, 8 percentage points in passengers, and 7 percentage points in yard switching. Tabulations are presented below.

Traffic First Four Months

	1954		1953	
Freight	*Ton-Mi (Mill.)*	*%*	*Ton-Mi (Mill.)*	*%*
Steam	59,461	14.47	111,045	24.42
Diesel	342,328	83.35	334,632	73.58
Passenger	*Car-Mi (Mill.)*	*%*	*Car-Mi (Mill.)*	*%*
Steam	83.8	8.57	167.8	16.03
Diesel	830.9	84.92	808.1	77.22
Switching	*Loco-Hr (Thous.)*	*%*	*Loco-Hr (Thous.)*	*%*
Steam	1,593	10.12	2,974	16.85
Diesel	14,008	88.93	14,458	81.92

Percent of Total Traffic Performed

	1950	1951	1952	1953
Freight Ton-Mi				
Steam	53.91	45.50	32.61	23.42
Diesel	44.13	52.66	65.52	74.64
Passenger Car-Mi				
Steam	36.31	30.89	21.83	13.99
Diesel	57.30	62.73	71.53	79.54
Switching Loco-Hr				
Steam	38.20	30.97	22.02	15.72
Diesel	60.45	67.79	76.72	83.14

Transportation Meeting

Current problems in the transportation field will be discussed by top industry and government officials at the ninth annual meeting of the American Society of Traffic and Transportation at the Mayflower Hotel in Washington, D. C., October 29.

B-L-H Railroad Tools to Japan

The Niles Tool Works Div., Baldwin-Lima-Hamilton Corp., announces that it will make delivery of an axle lathe and journal burnishing lathe to Sumitomo Metal Industries, Osaka, Japan. Both machine tools are designed as single purpose units for high production rates.

The axle lathe uses a combination of pneumatic mechanical and electronic control to machine new or used railroad car axles. The burnishing lathe handles car axles up to 9-ft long and 9⅞-in journal diam, by hydraulic power.

National Welding Meeting

Reports on the latest advances in welding and its uses will be featured at the national fall meeting of the American Welding Soc. in Chicago, Nov. 1 to 5. Nineteen sessions are scheduled covering 57 papers on all phases of welding activity. Among subjects of interest will be the welding of titanium, zirconium, molybdenum, and high temperature materials.

Locomotive Traction Test

Conclusive proof that hp rather than locomotive dead weight, is the important factor in mine haulage, is said to have been established by The Ruth Co., diesel mine locomotives manufacturer. In the test it was shown that the same tractive power necessary for hauling nine 3600-lb ore cars was obtainable from a redesigned locomotive of only 10,000-lb dead weight, compared to older style locomotives of 20,000 lb. Both had the same horsepower.

The dynamometer was equipped with cable-type connectors at each end and fitted into a special sliding yoke assembly. Hydraulic shock absorbers were affixed to opposite sides of this yoke so that shock loading or tests on rough track would not injure calibration of the instrument. Savings are indicated by one company which hauled over 275,000 tons for less than 1c per mi. Dillon states that the test is readily applicable to any type of powered vehicle where drawbar pulling power must be determined.

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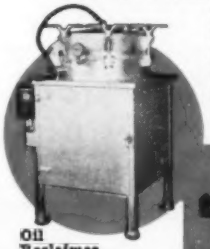

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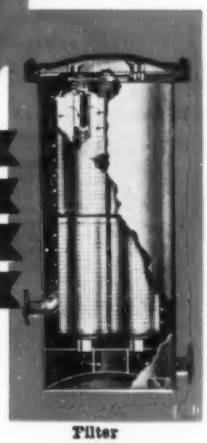
A complete range of sizes and systems for oil purification.



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news of our industry

DEMA Educational Meeting

The Diesel Engine Manufacturers Assn. announces it will hold its second 1-day educational meeting for the fall of 1954 at the Socony-Vacuum Oil Co.'s Paulsboro, N. J. Laboratories, Research and Development Dept., on October 21.

Members of the research staff of the company will discuss: application of the Socony-Vacuum engine analyzer, wear studies by radioactive technique, new developments in diesel lubricants, diesel fuel trends, and problems in the utilization of low-cost fuels, among other topics. Visitors to the laboratories, DEMA announces, will have an opportunity to see some interesting and important research now underway in the field of internal combustion engines.

Soils Corrosion of Cast Irons

The National Bureau of Standards has recently completed a long-range study of the corrosion of nickel cast iron in soils. From measurements on pipe specimens after exposure to different soil conditions, it has been possible to evaluate the effect of varying amounts of nickel in the castings. Sixteen exposure sites were employed, representing a wide variety of soils throughout the United States.

Corrosion is characterized by an adherent layer of corrosion products increasing in thickness as deterioration progresses. Thickening of this layer is partly due to electrochemical action between the ferritic and graphitic constituents of cast iron and to differences in potential arising from contact of the metal with the soil. Addition of nickel or of nickel plus chromium has been found to give improved corrosion resistance by reducing galvanic action within the metal itself.

Weight losses and depth of pitting were correlated with the composition of the specimens and the type of soil to which they were exposed. From the standpoint of both criteria, the high-alloy cast iron was considerably more resistant to corrosion than either the plain cast iron or the low-alloy cast irons.

In the low-alloy cast irons, additions of up to 3% nickel were found to reduce initial corrosion in poorly drained soils of low resistivity. However, weight losses for the maximum period of exposure did not differ greatly from plain cast iron losses, indicating that their corrosion rates decrease less with time than do rates for plain cast iron and alloys containing smaller amounts of nickel.

Measurements of hydraulic bursting pressure were also made on the samples. After exposure for periods up to 11 years and storage in the laboratory for approximately one year, most of the specimens withstood maximum pressure of 500 lb/in. even though subsequent removal of the corrosion products revealed numerous holes of various diameters. It was assumed reasonable that undisturbed buried cast-iron pipe, even in an advanced state of graphitic corrosion, is able to withstand the minimum pressure required of Class 150 pipe.

B-L-H Diesel Locomotive Orders

Three industrial locomotive orders have been received by the Baldwin-Lima-Hamilton Corp., it was recently announced.

Babcock & Wilcox Co. has placed an order for a 50-ton diesel-electric. The rear-cab locomotive is powered by a Cummins diesel rated 300 bhp at 2100 rpm, driving a Westinghouse generator. Two of the four axles are fitted with electric drive motors and tractive effort is 25,000 lb at 25 per cent adhesion.

General American Transportation Co. has ordered a 35-ton diesel hydraulic locomotive powered by a Cummins diesel engine rated 300 bhp at 2100 rpm. A Twin-Disc torque converter and B-L-H chain drive transmission deliver power to the axles. Tractive effort is 17,500 lb at 25 per cent adhesion.

An 80-ton diesel-electric has been ordered by Pittsburgh Plate Glass Co. The center-cab locomotive will be powered by two Cummins diesels each rated 300 bhp at 2100 rpm. Traction motors on each of the four axles will be fed by Westinghouse generators. Tractive effort will be 40,000 lb at 25 per cent adhesion.

news of our industry

South Bend Builds Sewage Plant

The necessity for a sewage plant in South Bend, Ind., has been brought about by a high rate of pollution of the St. Joseph River and increased population of the city, which was 101,268 in 1940 and grew to 115,624 in 10 years.

Worthington Corp. has been granted the contract for supplying equipment for the city's first sewage plant. Equipment will include two 6-cyl 735-hp dual-fuel engines to drive blowers, two 4-cyl 275-hp dual-fuel engines to drive two vertical mixflo pumps, and three compressors with motors. Contractors for the project, O. J. Shoemaker Inc., have advised that the plant will be located along the St. Joseph at the northern outskirts of South Bend.

ARBA Asks Roadbuilding Survey

All segments of the highway construction industry have been asked to evaluate their respective abilities to carry out a multi-billion dollar road building program as recommended by the President. In a resolution the board of directors of the American Road Builders' Assn. pointed out that an increased highway construction program will place grave additional responsibilities on the industry.

The resolution observed that a substantially increased federal aid highway program becomes fully operative on July 1, 1955 with additional recommendations for legislative action coming up shortly. For the diesel industry, it may be cited as a forecast of increased equipment buying and/or increased utilization of existing equipment, both pointing to increased sales.

Mack and White End Talks

Mack Trucks, Inc. has announced that it had "definitely terminated" discussions with the White Motor Co. relative to a possible consolidation of the two firms. The announcement was made to stifle persistent rumors that negotiations are still in progress with White.

Mr. E. D. Bransome, president and chairman of the board of Mack, stated: "During recent months Mack Trucks, Inc. and the White Motor Co. have held discussions, which were initiated by White, involving a possible consolidation. But these discussions have been definitely terminated by Mack . . . because no terms could be reached which, we consider, would be in the best interests of Mack stockholders".

Standby Sets Protect Hiahleah

Track owners at Hiahleah Race Course, Miami, Fla., saw to it recently that there will be mighty long odds against power failure when they installed two Caterpillar D375 diesel-electric generating sets. They will protect the heart of the track—the pari-mutuel boards, mutuel machines, calculators, automatic totalizators, and public address system.

Equipment furnished to Hiahleah for approximately $45,000 included the sets, plus auxiliaries, switchboard equipment, generators, auxiliary water pumps, air compressors, and heat exchangers. The sets were installed in a separate building. One engine has right-hand controls, the other left-hand, with a removable steel operating platform between the two units so that the operator may regulate both machines from one position.

Alco Locomotives to Mexico

The American Locomotive Co. announces it has delivered eight new 1600-hp diesel locomotives to the Pacific Railroad (Ferrocarril del Pacifico) of Mexico, to make a total of 25 Alco diesels operating on the line. The 6-motor, road switcher-type units have been shipped from the company's Schenectady, N. Y. shops to the railroad's northern terminus at Nogales, Arizona where they will be put into immediate freight service.

The locomotives represent part of an overall $80 million 4-year modernization program designed to rehabilitate the entire line. A loan of $61 million was granted to the road by the International Bank for Reconstruction this August. Immediate plans made possible by the loan include purchase of all-purpose diesel locomotives and light service diesels.

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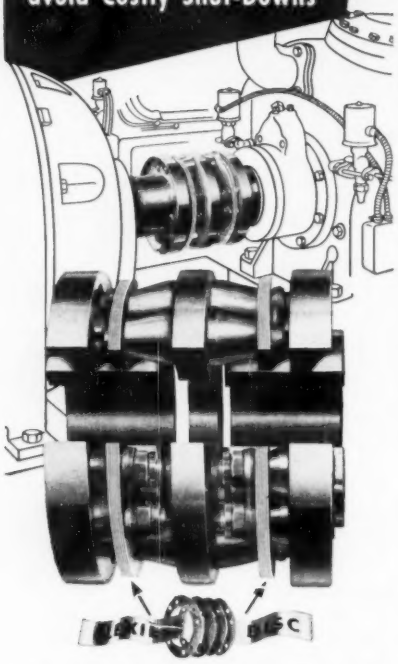
for Power Transmission to avoid Costly Shut-Downs



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NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
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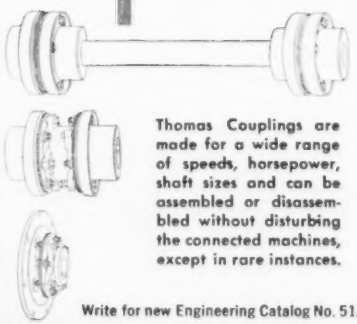

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Write for new Engineering Catalog No. 51A

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new literature

Centrifugal Blowers

Prepared by the Air Appliance Div., U. S. Hoffman Machinery Corp., 105 Fourth Ave., New York, N. Y., is a 12-page bulletin on multistage centrifugal blowers and exhausters, a revision of earlier literature.

Units described are built for applications requiring air pressure from 1 to 9 psi, or vacuum from 2 to 12 in of mercury. Design types and advantages are detailed along with charts showing capacity ranges.

What Chromium is Doing

"Chromium plating," Chromium Corp. of America, 51 E. 42 St., New York 17, N. Y., states, "has contributed much to engine durability by stubbornly holding wearing surfaces to their original designed sizes." It further states that within the bore of cylinder liners as well as upon numerous bearing surfaces, this metal restricts wear, eliminates corrosion, and maintains a continuous film of lubrication. A further characteristic is its workability as a rebuilder of worn surfaces.

All this is true, the company claims, when proper and precise finishing methods are used. To illustrate this, it has issued a bulletin specifically on the diesel engine. It is fully illustrated and is attainable upon request.

Multiple Stage Flowmeter

Commercial Research Laboratories, Inc., 20 Bartlett Ave., Detroit 3, Mich., has prepared a 4-page bulletin covering the design features, maximum flow capacities, maintenance requirements, and mounting drawings of its new Cox Type 12, 90 series flowmeter.

Technical data and illustrations contained include front and rear views of the series, full size sections of graduated 18-in logarithmic scales, sectional view of "inner wall" guides, and a complete flow range chart listing maximum capacities of various stages with or without a bypass orifice.

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The Rochester Straight-Form Thermometer is ordinarily supplied with the stem located at the bottom, but it's easily placed at any position around the dial that you want. Available in stem lengths from 2½" to 48". For more information on Rochester Straight-Form and other thermometers, write:

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34 Rockwood St., Rochester 10, N. Y.
DIAL THERMOMETERS GAUGES AMMETERS

new literature

Arc Welding Electrodes

Complete descriptive information along with application and procedure data on mild steel and low alloy arc welding electrodes are included in a 30-page catalog being offered by Metal & Thermit Corp., 100 E. 42 St., New York 17, N. Y. Designed to be helpful in selecting exactly the right electrode for the specific job, the new catalog also contains formulas for estimating welding costs, heat treating procedures, hardness conversion tables, standard welding symbols, and other useful reference material.

Cathodic Protection

Slanted toward both management executive and the engineer is a 12-page catalog covering the "whys" and "hows" of cathodic protection, issued by National Carbon Co., Div. of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y.

The booklet is illustrated with engineering sketches and aids, and typical curves showing ground bed to structure resistance. Information on the cost of corrosion and the economics of protection, where and when it can and should be applied, facts about impressed current systems and how they should be installed, typical ground bed installation details including design notes and tabulation of material requirements, are supplied.

Spray Painting Equipment

Binks Mfg. Co., 3122 Carroll Ave., Chicago 12, Ill., announces publication of Catalog 956, a 74-page booklet covering its complete line of spray painting equipment. The 1100 products and accessories are classified into 11 sections and keyed by thumb index.

Eight pages of the new catalog are given to the subject of correct nozzle selection. Tables show correct fluid and air nozzles, air requirement and needle for a wide range of fluids from standard paints to adhesives. Also provided is detailed information on spray guns, extensions and attachments, and accessories.

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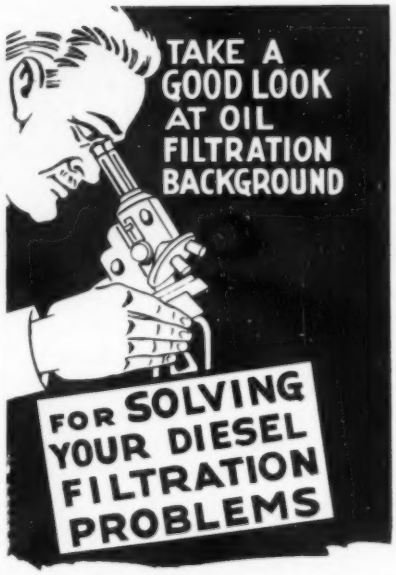

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new literature

Measuring and Control Devices

To illustrate various types of control and measuring equipment, a 4-page flyer has been prepared by Simplex Valve & Meter Co., 63th and Upland Sts., Philadelphia 42, Pa. General information is contained on both primary and secondary measuring devices.

Included are short descriptions and characteristics of standard and elliptical venturi tubes, as well as parabolic flumes used as primary devices to actuate secondary indicating, recording, and totalizing units. Illustrations are also included of miscellaneous types of air release and air inlet (vacuum breaking) valves and the new controlled closing valve, Type CCAV.

Overcoming Welding Problems

"How to Overcome Your Welding Problems and Improve Your Welding Techniques" is the title of an 8-page booklet released by Eutectic Welding Alloys Corp., 40-40 172 St., Flushing, N. Y. It explains the many variables facing the maintenance welder; the causes of stress raisers, starter cracks, and hard spots; and methods are given to avoid or minimize these.

Modern Mining Methods

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., has issued a 2-color booklet, MS-977, giving a pictorial review of its line of industrial equipment as applied by the mining industry. Action photos give the story of developments geared to mechanized operation and other postwar techniques of mining above and below ground.

Emergency Protective Equipment

Designed to assist industrial plants in choosing safety and rescue equipment for use in emergencies, "Disaster" has just been published by Mine Safety Appliances Co., 201 N. Braddock Ave., Pittsburgh 8, Pa.

The booklet makes no attempt to outline the organization of a disaster-control program but assumes the existence of teams within a plant whose job it is to effect rescue and recovery operations in case of tornadoes, fire, explosions, or other types of emergencies. It is published to show what items of equipment are needed by the teams. It is separated into five sections of equipment for the needs of a rescue team, engineering team, and a medical team, and contains a check chart for quick reference. Catalog description and picture of each item recommended are given.

Motor and Generator Course

National Carbon Co., Div. of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y., is offering a 2-year course in motor and generator maintenance by means of a series of pamphlets. The pamphlets, named "National Brush Digest", will be available to electrical and maintenance supervisors and operating men upon request.

The pamphlets will be issued every second month in the two years in short, easy-to-read, and clearly illustrated form. They are also expected to serve as a handy source of information on maintenance problems concerning brushes and commutation.

Hot Extrusions in Steel

Its first literature describing the new hot extruded shapes it is offering in stainless, tool, high temperature alloys, and other steels, is being offered by Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa.

The leaflet describes the advantages in purchasing extruded shapes that can be closer to finish sizes than regular hot rolled materials, reducing scrap losses, and saving in small quantity production. Illustrations of shapes already produced are also included.

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new literature

Shell and Tube Heat Exchanger

Complete description of stock and specially engineered Type "F" fixed tube bundle heat exchangers are given in revised Catalog No. 1254, offered by Young Radiator Co., Racine, Wis. Included are application photos, material and construction features, dimension drawings, and tables.

Four pages of the 12-page catalog are given to a simple guide to heat exchanger selection. This includes all necessary tables and formulas for selection involving the most common cases of water-to-water and water-to-oil heat transfer.

Iron Castings Glossary

International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., is making available a 36-page booklet explaining over 150 technical terms that are commonly used between suppliers and users of ferrous and nonferrous castings.

Multi-Unit Load Handling

Moving and storing of many types of multi-unit loads by its pallet hand lift trucks are pictured and described in a 12-page brochure published by The Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa.

Different pallet types, their designs and specifications, are featured in application photos. Cutaways also show operation of both the hydraulic and mechanical lifting mechanisms.

Grommet Brochure

Goshen Rubber Co., Inc., Goshen, Ind., is making available copies of its new 16-page brochure of grommets. Published in file folder form, it lists sizes and types in stock and various special sizes which can be furnished from true rubber, synthetic and silicone rubber compounds.

Capacitance and Inductance

"Formulas for Computing Capacitance and Inductance" by Chester Snow, 69 pages, is available from the National Bureau of Standards, Government Printing Office, Washington 25, D. C. It sells for 40c.

This collection of formulas contains some that are commonly used in electrical work and some that have been specially developed for precision work at the Bureau. Explicit formulas are given for computation of the capacitance between conductors having a great variety of geometrical configurations; the inductance, both self- and mutual, of circuits of various shapes; and the electrodynamic forces acting between coils when carrying current.

Formulas for skin effect and proximity effect in concentric cables and parallel wires are also included. The formulas for the simpler configurations are given in terms of the elementary functions. Those of more complex shapes involve the use of Legendre polynominals, Legendre functions, and elliptic functions. One section is devoted to a discussion of the relation between the Legendre and the elliptic functions.

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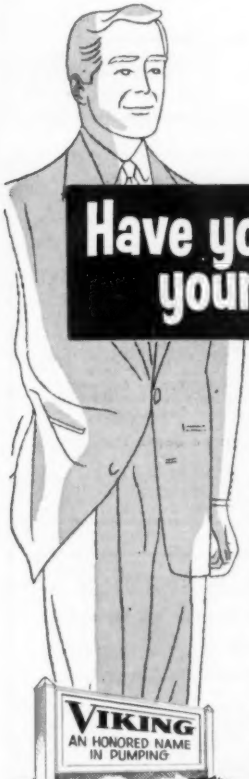

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What Do You Know!

(*Answers to questions on Page 40*)

1. Correct answer is "b". Efficiency of oil bath cleaners remains fairly constant over a wide range of dirt loads. Increased restriction to incoming air is the major factor. For a discussion of this see the article on Page 44.

2. "b" is correct answer. Efficiency of the overall system is principally determined by that of the oil bath cleaner. Main purpose of a precleaner is to reduce the dirt load to the major unit. For discussion see article mentioned above.

3. Correct answer is "a". Wear may be concentrated on one side and a deeper grind necessary to maintain stroke and angular relationship of pins. See Page 50.

4. Correct answers are "c" and "e". They are the main contributors to wear and sluggish operation within the governor. The others are offenders, however. See article on Page 46.

5. Correct answer is "c". The reasons for this are covered in detail in the article on Page 62.

6. Correct answer is "a". The flatter angle of the seat reduces the effect of valve stem misalignment. For discussion see the article appearing on Page 62.

7. "b" is correct answer. For an explanation of this see the article referred to above.

8. Correct answer is "b". Axis of the least worn portion of the guide bore is the most reliable reference for reestablishing valve geometry. See article mentioned above.

9. Correct answer is "a". Principal variable with load changes is the amount of fuel injected. This is reflected in the heat of exhaust gases. For discussion see Page 66.

organizational news

Ohio Crankshaft Managers

The Ohio Crankshaft Co. announces two appointments in the TOCCO Div. L. C. Schweitzer is the new assistant general manager and A. O. Wood succeeds him as Chicago district manager.

L. C. Schweitzer

A. O. Wood

Mr. Schweitzer has been with the company since 1939 when he came to it from Westinghouse Electric Co. He established TOCCO's first sales office in Chicago and then went on to serve as sales engineer, district sales manager, and district manager.

Mr. Wood is a company veteran of 25 years. He started as an electrician and in 1937 was transferred to his present division where he shortly became chief engineer. He was made Chicago district engineer in 1947.

G. E. Locomotive Appointments

Two managers and a specialist have been named to the parts and repairs sales section of the General Electric Co.'s Locomotive and Car Equipment Dept.

Donald G. Carr, new manager of the railroad regional parts center, began work with the company in 1917. He later became parts specialist and assistant manager of the parts section and in 1952 became manager of locomotive parts.

James H. Williams, now manager of parts sales, joined the company in 1936 in design and application engineering capacity. In 1946 he worked in railroad and industrial locomotive equipment sales and served as assistant production manager in the department until his recent appointment.

K. O. Anderson, locomotive rebuild specialist and sales engineer, first joined GE in 1947 on an engineering training program. He was later assigned to the industrial locomotive mechanical design section and in 1951 was transferred to the department's rolling stock sales section where he specialized in rail car equipment for export.

Centrico President Dies

Heinz W. Habig, 33, and his wife were killed in the crash of a K.L.M. Super-Constellation while returning from a 3-month trip to Europe where he visited new industrial separator installations. The Habigs had no children.

Mr. Habig was president of Centrico Inc., sole distributors and representatives in the U.S. for Westfalia Separator A.G., manufacturers of centrifugal separators. He is survived by his father, president of Westfalia A.G., his mother, and sister.

Aeroquip Advancements

Aeroquip Corp. makes known the appointment of two managers for its West Coast subsidiary, Aero-Coupling Corp. Forrest F. Hinkley has been advanced to general manager and Charles W. Sawhill to general sales manager.

Mr. Hinkley will be responsible for all sales and manufacturing functions. He has been a company executive for the past 11 years. Starting as assistant factory superintendent,

F. F. Hinkley

C. W. Sawhill

he has successively held the posts of production manager, director of materials, and subsidiary operations director.

Mr. Sawhill will be responsible for sales to industrial and aircraft accounts. He was formerly industrial sales manager of the subsidiary and before that was affiliated with Douglas Aircraft Co.

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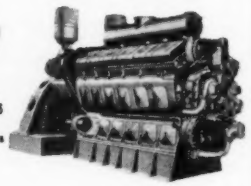

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organizational news

Nordberg Names Diesel Expert

Mr. Ralph Miller has been appointed to the post of consultant and director of "Supairthermal" development and application, Heavy Machinery Div., by Nordberg Mfg. Co.

Mr. Miller has been prominent in development of internal combustion engines both in the U.S. and in Europe. He has been associated with developmental work on the first American diesel engine for railroad service, the first supercharged dual-fuel engine, and the first American 4-cycle supercharged "V" engine for locomotives. He is well known for the Miller system of turbocharging.

A native of Denmark, Mr. Miller came to the United States after serving in the Danish Navy. He was employed by the De La Vergne Ma-

Ralph Miller

chine Co. and was assigned to assist W. T. Price in development of the first American cold-starting, solid-injection engine. Engine design and development work followed with the Ingersoll Rand Co., Superior Engine Co., American Locomotive Co., and Worthington Corp.

In 1945, Mr. Miller joined Nordberg as chief engineer of the 4-cycle engine department. His major activity has been in the application of intercooled turbocharged engines and development of "Supairthermal" engines using his system of turbocharging under world-wide exclusive license.

Detroit Controls Director

The appointment of Frank A. Parker to the position of director of research and engineering has been announced by Detroit Controls Corp.

Mr. Parker was formerly director of the company's research division at Redwood City, Cal., where he worked on development of automatic controls for home, industry, and the armed forces. Prior to that, he was on the staff of Princeton University.

H. O. Penn Representative

Thomas W. Uhl has been appointed sales representative for the H. O. Penn Machinery Co., Inc., Caterpillar dealer.

Thomas W. Uhl

Mr. Uhl assumes responsibility for the Borough of Queens, N. Y., recently made available by advancement of Stanley E. Wardell to sales promotion manager. About a year and a half ago, Mr. Uhl set up offices as a manufacturer's representative in Queens. Prior to that he spent three years as sales representative for Whayne Supply Co., Caterpillar dealer at Louisville, Ky.

Dr. Diesel's Son to Visit U.S.A.

Dr. Eugen Diesel, son of the inventor of the diesel engine, is expected to visit this country shortly for a 3-month sojourn. He is coming by way of Japan.

Dr. Eugen Diesel

Dr. Diesel resides in Bavaria, Germany. He is a doctor of philosophy and a writer. His best-known work is "Phenomena of Technical Science", a philosophical work. He has also written a biography of his father, "Rudolf Diesel, the Man, his Work, his Fate". Another book, which he co-authored, is entitled "Struggle About an Engine, the First Diesel Engine in America".

During his stay in the United States, Dr. Diesel plans to deliver several talks on technical science.

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organizational news

Worthington Appointments

Recent advancements at Worthington Corp. concern the appointments of George L. Ziegler to manager of parts service and Walter E. Max to general superintendent of the Buffalo works.

Mr. Ziegler's most recent post was that of assistant works manager of the Buffalo works which he took on in 1951. He first joined the organization in 1925 following his graduation from Northeastern University. Among other assignments, he was manager—service and erection department. In his new position, he will make his headquarters at Harrison, N. J.

Mr. Max joined Worthington in 1934 as an apprentice in the machine shop. In 1936 he left the company for three years to study mechanical engineering. In 1950 he was named manager of the service and erection department. Harry P. Yount will replace him at this position, who will in turn be succeeded at his former position as assistant manager of the department by John J. Hoefner.

Le Roi Ups Three

Le Roi Co. announces the appointments of Jack E. Heuser to vice president in charge of sales, Ray H. Rodolf to general manager, compressor division, and Herschel V. Hiatt to general manager, engine division.

J. E. Heuser

R. H. Rodolf

H. V. Hiatt

Mr. Heuser will be responsible for the organization and management of a newly created sales division to sell and service all the company products. He first joined the company in 1939. In 1941 he went to Ampco Metal, Inc. and rejoined Le Roi in 1946 as assistant to the general sales manager. He vacates the post of engine division sales manager to take his new assignment.

Mr. Rodolf moves up from the post of sales manager, construction and mining division. He first came to the company in 1950 as a West Coast representative. Before that he was with Gardner-Denver Co.

Mr. Hiatt joined Le Roi a year ago as director of engineering. He worked with the Allison Div. of General Motors Corp. before that and with the Warner Corp.

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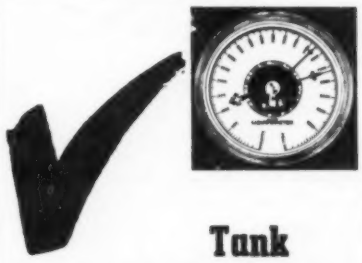
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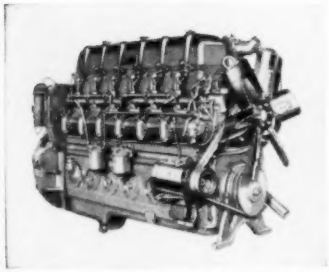

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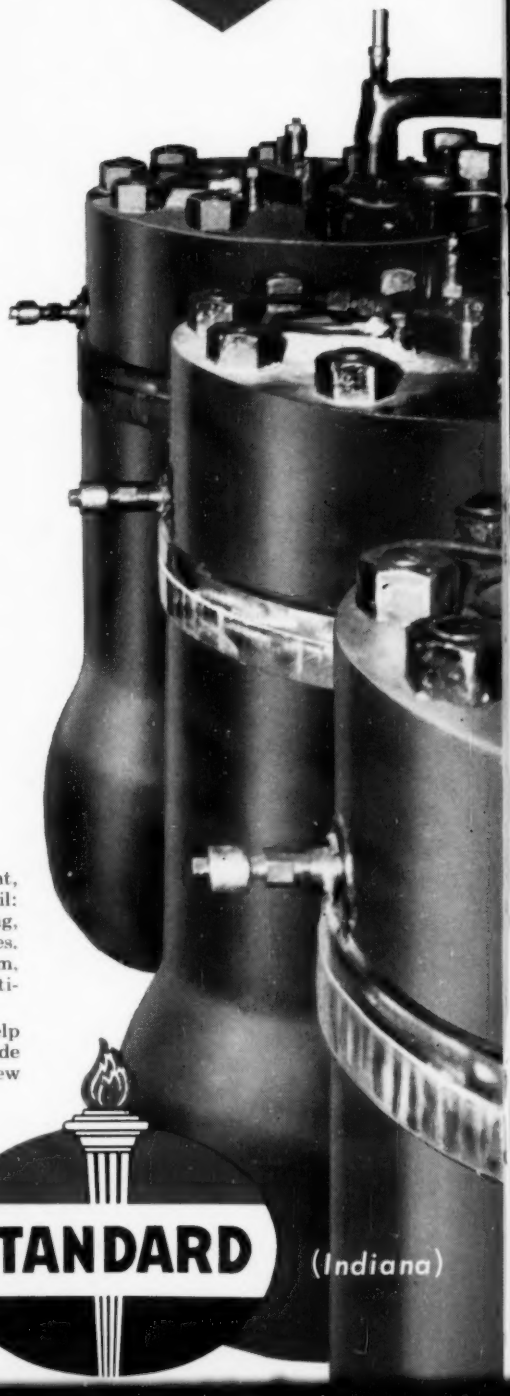
Bancroft Superintendent, Verne Austin (left) consults with Standard Oil lubrication specialist R. R. Spargo, (right) on periodic check-up to see that STANDARD HD is still in like-new condition.



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